

.. Electro-Therapeutical Catalogue..



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McIntosh Battery and Optical Co.

521 TO 531 WABASH AVENUE, CHICAGO, ILL., U.S.A.

GREETING...





IT is sometimes worth while to look outside of our dusty tomes and to stop our thoughts on pathology, physiology and therapeutics, to see how some of the instruments used in the treatment of disease are produced. Many of the instruments used in medicine have

sprung, Medusa-like, from the brain of the busy practitioner who has the Yankee gift of making with his jack-knife the things that he most needs. The origin of the McIntosh Portable Combined Galvanic and Faradic Battery was after this manner. A physician, in whom the inventive faculty was well developed, a man who desired to put into practice his day dream, who had the ability, apparatus and time to do so, succeeded in building a battery so thoroughly good, and one that has met the requirements of the busy practitioner for the past twenty years so admirably, that scarcely any changes have been found necessary in its original construction. Around this battery as a nucleus has grown the

McIntosh Battery and Optical Co.,

Which is the largest manufacturer of Electrical Apparatus for medical purposes in the United States, if not in the world. Starting with an instrument, which was unquestionably good, this Company has gradually come into possession of equally good apparatus in special departments of electro-therapeutics, until to-day, in our new and magnificently equipped home in the Ludington Building, Nos. 521, 523, 525, 527, 529 and 531 Wabash Avenue, we have commodious and elegant show rooms, and here we shall be pleased to have you call upon us.

We have added many new styles of Medical Batteries to our regular line, as also a new Current Controller, by which the commercial currents, either constant or alternating, may be safely adapted to therapeutic use.

The McIntosh Battery and Optical Co. sustained at the World's Fair its well-earned reputation as the Foremost Manufacturers of Electro-Therapeutic Appliances. Our magnificent display in the Electricity Building attracted world-wide attention, and it affords us much pleasure to announce that the McIntosh Battery and Optical Co. received the Highest Award for Electro-Medical, Dental and Surgical Apparatus, "consisting of a full line of Appliances, such as are used by physicians, surgeons and dentists when employing electricity for diagnostic or therapeutic purposes." This award is granted for "the variety of the exhibit and the excellence in design and workmanship of the various articles."

Nos. 521 to 531 Wabash Avenue, CHICAGO, U. S. A.



"The measure of choosing well is whether a a man likes what he has chosen."

WE ARE OFTEN ASKED

"WHAT IS THE BEST BATTERY FOR MY USE?"

To answer the question so often asked by the profession in regard to batteries would require a treatise on electro-therapeutics; yet we may, in this short article, give a few hints that will be of advantage to the busy practitioner who desires a battery, yet has not time to investigate the subject.

THE BEST FORM OF BATTERY.

We believe the very best "every-day-in-the-year" portable Combined Galvanic and Faradic Batteries to be found in the world are the McIntosh Zinc-Carbon Bichromate Fluid Batteries; but the desire to escape from the annoyance of frequent renewal of battery fluid and elements, and the further annoyance and damage caused by the leakage of corrosive liquids has caused a loud call for a reliable dry cell battery to take the place of the "antiquated" Strictly speaking, the appellation "Dry Cell" as applied to Galvanic Batteries is a misnomer. The galvanic current is produced by chemical action, and chemical action can only occur between the atoms or molecules of different substances (usually metals) acting upon each other at insensible The medium of communication between the molecules is a liquid, hence in all Galvanic Batteries there must be a liquid or a paste, or some form of wet material in which the elements are placed. A dry battery so-called is therefore only a form of cell containing the least possible quantity of liquid, so contained as to preclude the danger of slopping over under ordinary conditions of usage. The very best and most enduring of the so-called dry cells, is the Chloride of Silver Cell. *Theoretically* the Chloride of Silver Cell cannot deteriorate when the battery is not in use, and when brought into action will continue to render effective service with an E. M. F. of 1.75 Volts per cell, until all of the silver chloride shall have been converted into metallic silver. Practically THERE IS NO CHLORIDE OF SILVER BATTERY ON THE MARKET which yieldsan E. M. F. of over 1.50 Volts per cell, when freshly charged and this voltage soon falls to about 1 Volt or less per cell; added to this serious fault is the universal testimony that the battery slowly but surely, by some local action within the cell, destroys itself when not in use. We submit the following comparison:

36 Cells McIntosh Zinc Carbon Bichromate Battery, E. M. F. 72 Volts and 5000 Milliamperes on short circuit.

36 Cells Diamond-Carbon, Law or LaClanche, E. M. F. 54 Volts and 1000 Milliamperes on short circuit.

36 Cells Chloride of Silver, E. M. F. 36 Volts and 350 Milliamperes on short circuit.

The claim is made that the chloride of silver cell retains its E. M. F. without impairment in continuous service, until the cell is nearly exhausted. But the practitioner does not wish to use the galvanic current through several hours of time; what he wants is to know that his battery can be relied upon to give him its full E. M. F. and amperage, through an operation lasting from a few seconds to perhaps ten minutes.

THE POPULAR CLAMOR among the profession during the past year or two, for a so-called "Dry Cell" or Chloride of Silver Battery, is largely due to partial or entire ignorance of the physical laws above referred to; as also to the fact

that many physicians whose busy lives precluded the possibility of making a special study of the subject, believed all that has been told them in regard to these batteries.

For diagnostic purposes, or where there is great resistance to the passage of the current, or for special testing this class of batteries will do well enough; but for electrolytic uses, such as is required in gynæcological practice, or subcutaneous work of any kind, they are totally inadequate. A CAREFUL CONSID-ERATION of these facts is causing a revulsion of the craze for Dry Cell batteries and is leading the most skillful practitioners to return to the old standard McIntosh Bichromate Zinc Carbon batteries for portable use, and to the best forms of Chloride of Ammonium Cells for stationary or office Batteries. galvanic battery, to be of any therapeutic use to the physician, should have not less than 12 cells of zinc carbon type with acid solution, giving nearly 2 volts to each cell, or if some form of chloride cell is used, not less than 20 cells giving 1.50 volts to each cell. For all ordinary electrolytic work either of the above would suffice, but FOR MAXIMUM OPERATIONS WE WOULD ADVISE a battery of from 18 to 24 zinc caroon acid Bichromate cells, or from 36 to 50 chloride cells. Such a battery would give about 50 volts electromotive force, and if we were treating a case of fibroid tumor of the uterus (using a large surface abdominal electrode to reduce the resistance to the minimum), our milliampere meter being in circuit would register a current of about 250 milliamperes, which is considered more than sufficient for this work. "The day is near at hand when the dynamo will displace the primary battery as a source of electric energy for therapeutic purposes in all places where it is available." Some form of dynamo circuit is now in use in the majority of cities in this country, even those of but a few thousand inhabitants, and can be utilized by the physician for his office work at least. The physician who has at his disposal a current from a constant current dynamo, requires only a reliable controller, and this we offer in the McINTOSH CURRENT CONTROLLER for commercial events. This same controller in connection with the 52 volt alternating current furnishes par excellence the much lauded sinusoidal current.

GALVANO-CAUTERY.—The extensive use of cautery for surgical purposes now brings to our notice the battery for producing galvano-cautery, which consists of two large galvanic cells, giving a current of from 3 to 30 amperes, with an electro-motive force of about 4 volts. The small cautery electrodes require a current of 2 to 3 amperes, and the large from 10 to 30 amperes.

These electrodes should be as small as possible, for two reasons, viz: to save the current, and to prevent such an accumulation of heat as would destroy surrounding tissues. The best form of acid battery is the plunge battery, consisting of large plates so arranged on a base that they can be immersed in the fluid to any required depth, but of all cautery batteries lately brought to the notice of physicians the secondary, or so-called storage battery, is the ideal. It retains a charge for weeks, keeps up its electro-motive force until it is nearly exhausted, and is more portable than any form of primary battery. As the storage cell is replacing in great measure the various forms of plunge cautery batteries, so the commercial current is rapidly displacing the storage battery.

The McINTOSH TRANSFORMER in connection with the 52 volt alternating current, enables its physician to heat cautery knives or light small lamps, affording him perfect control of unvarying conditions throughout the most prolonged operation.

Physicians should remember that all prices in this catalogue, excepting those marked "net," are subject to a liberal discount.

On the closing pages of this catalogue will be found a list of the principal dealers who handle our goods. Our batteries and electrodes can be purchased from these houses at the same discount which we offer to physicians.

THE FOLLOWING ABSTRACT IS TAKEN FROM A VERY VALUABLE MONOGRAPH ON

ELECTRO-THERAPEUTICS IN THE PRACTICE OF DERMATOLOGY,

IN THE JOURNAL OF ELECTRO-THERAPEUTICS FOR SEPTEMBER, 1891.
BY RICHARD B. FAULKNER, M. D., ALLEGHENY, PA.

It answers, concisely and fully, those primal queries, which present themselves to the practitioner whose thoughts are for the first time turning to the practice of Electro-Therapy. We take this opportunity to express our grateful thanks to the author for the very kind and flattering, (though we trust not unmerited) praise which in the course of his paper he bestows upon the McIntosh Battery and Optical Co., both as to the quality of our goods, and our method of conducting our business.

The author says:

"Electricity is a potent agent; a great stimulator of absorption; and a perfect, controllable, decomposer of living tissue.

The electrolytic process is very simple. Connect two wires with a galvanic battery, dip them into water, and its dissolution occurs. If the ends of the two wires be sharpened, and then thrust into the living flesh, the positive pole, generating oxygen and acids, is seen to be powerfully astringent, producing firm coagulation of the albuminous tissue; the negative, generating hydrogen and alkalies, softens, disintegrates, and even causes hæmorrhage. The positive is anodyne; the negative is stimulant. If a steel needle attached to the positive pole is inserted into the flesh and the circuit closed, the needle will become oxydized immediately, and a black metallic speck appear in the skin. For this reason, gold needles are used with the positive pole.

The therapeutic value of electrolysis has passed beyond the controversy of many competent observers, and the chief question that now pertains to the method, relates to the best and most economical arrangement for its application.

The selection of instruments is not difficult. It is determined by the object in view. To accomplish different purposes, electric batteries are constructed upon different principles. Some batteries have high tension; others great quantity. Tension produces electrolysis; quantity produces cautery. The term tension has a number of synonyms. The volt battery, electrolytic, galvanic, continuous, and tension battery is one and the same. While, on the contrary, the galvano-cautery, storage, accumulator, quantity, and heating battery is also one and the same. Tension batteries require only a little quantity of electricity, and for this reason weak cells, like the Leclanché, are used. Quantity batteries require large, powerful cells, like the gravity.

The laws of electricity embrace four units, and the comprehension of these renders the selection of a battery very easy. It enables you also to describe the effects of particular currents, and to record your results that others may be able to follow precisely the same course of treatment.

These units are called the coulomb, ampère, volt, and ohm. They represent, respectively, quantity, current strength, electro-motive force, and resistance. A coulomb is the quantity of electricity transmitted in one second through one ohm by one volt. An ampère is the current carried in one second through the resistance of one ohm by the force of one volt. A volt represents a force capable of generating a velocity of one meter per second through a mass of one gramme. The Daniells cell is selected as the standard, and has

an electro-motive force of one volt. An *ohm* is the unit of resistance, and is equal to the resistance of a cylindrical wire of pure copper practically 250 feet in length, and the one-twentieth of an inch in diameter. The quantity of a Daniells cell is one coulomb; the amount of wire necessary to resist its flow is one ohm; the flow or motive force is one volt; and a current composed of one coulomb per second has the strength of one ampère.

Water seeks its level; electricity seeks to escape from high tension to low—from highly charged bodies to the earth, and vice versa, until its distribution is equalized, or, as they say, the electric level is reached. The electric level is expressed by the term potential.

According to the foregoing laws and principles, we can build a battery to suit any purpose. If the desire is to stimulate a certain nerve, or produce contraction of a certain muscle by passing the constant current through intermediate tissues, the electro-motive force at our command must be such as to overcome the resistance of the body between these points. The resisting power of the human body is very wonderful. It has double the resistance of the entire Atlantic cable. To overcome the resistance in our illustration, there must be a high electro-motive force, perhaps thirty volts, but only a small current, say the one $\frac{100}{1000}$ of an ampère. If, in another instance, we wish to light a lamp to explore the larynx, the resistance of a small carbon or wire is nothing as compared to that of the human body, and so a much smaller electro-motive force is required; five volts will answer, but a stronger current is necessary, from one to three ampères.

Again, suppose the desire is to heat a knife for the purpose of galvanocautery. The very small amount of platinum offers little resistance, and the electro-motive force of four volts is ample; but to obtain the necessary degree of heat, from ten to thirty-five ampères of current strength is required.

Twenty ampères, with an electro-motive force of five volts, is sufficient to operate a low resistance motor.

The need of a battery, at one time, with high tension and small current, and at another for an instrument with low tension and great current is at first very perplexing. This is the point at which the tradesman plies his art. The customer wants a battery capable of doing everything. And the dealer generally sells him one that won't do anything. The difference between a tension and a cautery battery is due to the manner in which the cells are connected. The object of a tension battery is the development of electro-motive force. No matter how many cells are added, the current strength remains the same—one ampère. When connected for tension effects, every cell counts one volt, and adds one unit to the battery in overcoming resistance. To make a tension battery, the zinc of one cell is connected with the carbon of the next, and so throughout the series. My tension battery has thirty diamond carbon cells, the best variety of Leclanché cells ever devised, with an electro-motive force of fifty-four volts. These cells have more than double the carbon exposure of any other.

The tension battery is used for electrolysis.

The current of electricity so often mentioned as the powerful current of Apostoli has the strength of from 200 to 300 milliampères, that is, from the fifth to the quarter of an ampere; or, in other words, the one-fifth to the one-quarter of the small quantity of electricity generated in a single cup is sufficient to accomplish the wonderful work of the great French savant!

To make a cautery battery, all the zincs of all the cells are connected together as one great zinc, and all the carbons are connected as one great carbon. In this manner great quantity is generated. Every cell thus added counts one ampere.

In the selection of cells for the different kinds of batteries there is ground for judgment. For a stationary galvanic battery the Leclanché is preferred. It is the cheapest of all cells. It has high voltage. It is a very weak cell; and the objection to it is that the current falls rapidly when in use, owing to polarization. For cautery purpose, the plunge cells of bichromate of potash or soda are sufficiently good for light searing. But for heavy cautery operations the only satisfactory battery is that known as the accumulator or storage. These accumulators can be stored from any source from whence electricity can be obtained; from electric light wires, dynamos, street car power houses, or primary cells. To charge a storage battery the primary cells must be powerful; such as the gravity. The cell I have in use is the improved Hussey Bluestone cell. It is the most powerful yet contrived. It generates a current of from 8/10 to 11/2 amperes per hour, according to how it is connected. To charge a storage battery, the cells are usually connected after the manner of a tension battery. But you can arrange the cells so as to make either ampereage or voltage more or less as you desire. For example, my cells are connected in pairs; this increases the ampereage and diminishes the voltage one-half. Triplets give still greater ampereage, with less voltage. The smallest cautery knives, used in throat practice, require a current of ten amperes to produce a cherry-red heat. The largest cautery knives used in general surgery require thirty-five amperes. The storage battery which I use will sustain the largest cautery knife at an incandescent heat for over two hours. It has a capacity of '5 amperes, with an electro-motive force of 6 to 12 volts. Four to six volts are ample to run small electric motors, fans and surgeon's drills. My battery testores 92 per cent of the current. It is guaranteed free from the danger of buckling when in use. It is a perfect accumulator, small and beautiful.

The chloride of silver, or so-called "dry," batteries will disappoint everybody who invests in them. They are never dry; fumes are generated within the battery and follow the wires; they short circuit; they exhaust themselves when not in use; they generate unsteady currents; they are complicated; they require the instrument maker to replenish all the fluids and other parts; they are expensive, experimental and recommended by no authority to my knowledge.

The McIntosh Battery and Optical Co., of Chicago, now make all of my electric apparatus. This firm is one of the fairest and most courteous with which I have ever had business. Their goods are made with scientific care, substantial, and always finely finished. My McIntosh Cabinet Battery No. 2, I believe to be without an equal for all galvanic and faradic effects. It is simple in construction, cleanly, powerful, durable, and always in order. I have used it daily for over three years with absolutely no attention whatever having been required, and without the expenditure of a single penny for replenishment or repair in all that time."

A VALUABLE SERIES OF PAPERS.

Reprinted from the Bulletin of the Electro-Therapeutical Laboratory of the University of Michigan.

THE CONSTANT CURRENT.

The constant or galvanic current has a wide range of therapeutic application. Its use, at one time largely empirical, is now based upon its known physical and physiological action on the constituents of living tissues; and the therapeutic results sought to be attained by means of it are more uniformly successful in proportion as the operator is familiar with and pays heed to the physical and physiological effects it produces and skillfully adapts them to the requirements in the disease treated.

The physical effects which attend the passage of a constant current through living animal tissues, are, as far as known, included under electrolysis, cataphoresis and catalysis, all of which can be turned to account therapeutically.

The physiological effects that have been noticed of such currents are to some extent dependent, no doubt, upon the physical phenomena; but there are others, such as the electrotonic effects induced in a nerve whereby its excitability is heightened or decreased according as it is subjected to the influence of the current at the anode or the cathode, and the contractile responses of muscular tissue to the make and break of the current, both in health and disease, that are peculiarly physiological, due directly to the properties possessed by these tissues while in a vital state. The physiological responses in nerve and muscle resulting from the passage of a constant current through them under certain conditions have become to the neurologist an indispensable requsite for determining the functional and structural condition of nerves and muscles when for any reason their integrity is called in question. Electric diagnosis does not depend wholly upon the use of the constant current, but taken in connection with induced current applications it elicits information regarding the action and state of nutrition of nerves and muscles with a certainty and accuracy that contributes much to both the diagnosis and prognosis of disorders affecting these structures.

PHYSIOLOGICAL ACTION OF CONSTANT CURRENTS.

There are certain reactions which constant or galvanic currents bring about when applied to living animal tissues which cannot be regarded as physical or mechanical effects of the current since they are dependent upon the peculiar properties of living animal tissues and the nature of their response as such to this form of stimulus or excitant. These it seems proper to designate as physiological effects, and as they have long served as a rational basis for therapeutic applications with this form of current, a special mention of them is required. The physiological effects that are best known to us both from experiments in the physiological laboratory and from electro-therapeutic observations may be classified as:

Reactions of muscular tissue Reactions of nerve tissue, Reactions of protoplasm.

Muscular Tissue Reactions.-Muscular tissue, whether of the striped or unstriped variety, may be caused to contract by the direct application to it of either pole of a continuous or galvanic current, the other pole being placed at some distant point upon the body to complete the circuit. The strength of the response in normal muscle will depend upon the strength of the current used. On voluntary muscle in normal condition a certain order of contractions has been found to occur, which order is changed in diseased or degenerated muscle, and this serves, as well as other features in the nature of the response, to distinguish normal from abnormal states in muscular tissue and is a valuable means of diagnosis, a subject which will receive separate consideration in a later number of this bulletin. A continuous current, unvarying in its intensity, when applied to a muscle, causes a contraction only at the moment when the current is closed or opened; at the "make" and "break" of the current as it is termed. This is due to the fact that irritable tissue requires a change of conditions for excitation. It is seldom true, however, that an absolute uniformity of potential and current can be or is maintained, even for a short interval, in a mass of muscle in the human body through which a current is made to pass—since in addition to the muscle, the skin, tendons, bones, blood vessels, fluids and nerves form a part of the path for the circuit and in them, and in the muscle as well, the resistance offered to the current is constantly varying so that the current to the muscle is seldom for an instant constant, and while the most marked contractions may be noticed at the "make" and "break," yet the current in the interval between the closing and opening of the current still produces some contractile effects oftentimes quite noticeable.

Involuntary or unstriped muscular tissue responds more slowly to any for of stimulus than the striped variety, and consequently a slowly interrupted galvanic current is better calculated than any other artificial agent to excite contraction in this variety of muscular tissue and does so with the least possible harm. Now when we consider how universal is muscular tissue of one or the other variety in all parts of an animal organism, and how largely the functions of the body are dependent upon its action, the therapeutic value of an agent that can excite this tissue, when for any reason its action is feeble or faulty, becomes manifest. Involuntary muscle in the digestive tract can be thus influenced, when this effect is required, as in the atony of the stomach or torpid peristaltic action in the large or small intestines, resulting in constipation. Local weakness of circulation, giving rise to passive congestion of liver, spleen, lungs, uterus or central nervous system, can be relieved by stimulating the muscular structure in the arterial tunics. The gall bladder and urinary bladder can be evacuated by like means when overdistended by reason of feebleness of contracting power, while voluntary muscle in any part when feeble, atonic, paretic or paralyzed from faulty innervation, can be brought into action and its nutrition quickened. Therefore, therapeutic applications of the constant current can be made to muscular structure with the view of exciting its function and improving and maintaining its nutrition when it has suffered impairment by reason of abnormal conditions originating in the muscle itself, or secondary to disorder in its governing nerves.

Nerve Tissue Reactions.—The result following the application of the constant current to nerve tissue differs according to the nature of the tissue in-

fluenced, i. e., whether it is peripheral nerve, sensory, motor, secretory or nerve cells in brain, cord, or ganglia. Polar applications along the course of a motor nerve will cause effects on the muscles supplied by the nerve similar to those obtained by direct application to the muscle itself, except that the former method is better calculated to cause the muscle to contract uniformly and in its entirety. This fact is utilized for electric diagnosis in determining the state of the nerve and muscles supplied by it, as well as for treatment when the muscle group supplied by any nerve is impaired through or by reason of fault in its nerve supply.

Sensory nerves react to constant current applications by an increase or decrease of their excitability, according as the application is made with the positive or negative electrode. The anodal application diminishes the excitability of the sensory nerve, and the cathodal application increases it. Physiologists have made use of the name anelectrotonus for the anodal effect of the current, and catelectrotonus for the cathodal effect, and electro-therapeutists have adopted these terms.

Wherever sensory nerve action is abnormally increased, causing pain, neuralgia, hyperæsthesia, the anode of a continuous current applied over it for a few minutes will produce in the immediate vicinity of the electrode a sedative effect, provided the current has been used strong enough and remained long enough, and has not been removed suddenly but gradually, that is, the strength of current carefully decreased to zero before the electrode is taken away. On the contrary, if the sensory nerve action is dull, sluggish, the area supplied by it numb or anæsthetic, the application of the cathode will arouse and stimulate it and increase its irritability, and this effect remains for some time provided the same precaution is taken to withdraw the current gradually. It is possible that these electrotonic effects, both upon motor and sensory nerves, are due in a great measure to the electrolytic and cataphoric influence of the continuous current that has been previously considered in the pages of this bulletin, but such results are possible only by reason of the peculiar properties of nerve and muscle, and the fact that they respond in a somewhat similar manner to certain methods of application of induction and alternating currents as well as to mechanical vibrations, shows that electrolytic and cataphoric action are not the only causes.

Effects Upon Protoplasm.—The formless cell contents of living tissue, that substance in which all life processes take place, is seen to be directly changed in form by currents that are not strong enough to rend apart its complex molecular combinations. The nucleus of the cells can be seen to change position with reference to the cell protoplasm, and experience proves that cell activities are quickened or depressed and nutrition modified by the employment of continuous currents to a greater degree than by any other form of electric energy as yet employed in therapeutics. Experience must yet determine when and by what methods the action of the current upon cellular life processes is beneficial or otherwise.

CATAPHORESIS.

The physical phenomena grouped under the head of cataphoresis or electric-endosmose should be considered next to those of electrolysis in any attempt at a rational explanation of the changes affected in the normal, or diseased state of the body by the transmission of a constant current through it.

We will not attempt here to go into the history of experimentation, or the citation of authorities. The facts of electric-endosmose have become an authentic chapter in the science of electric phenomena and have received contributions from many of the ablest physicists, from the time when Reuss, of Moscow, in 1807 first drew attention to the subject, down to the present time.

The first study of these phenomena in the physiological field is credited to Porret. His researches were published in the Annals of Philosophy in 1815.

The physical facts as they stand related to the therapeutic employment of them are briefly these: Ordinary osmosis is the transfusion of liquids of different densities and composition through porous septa or membranes. When two such liquids differing in densities are at the same level, but separated by such a porous partition, an interchange takes place but the lighter liquid flows toward the denser more rapidly and brings about a difference in level in favor of the denser liquid. The current that is directed toward the higher level is called the endosmotic current. The forcing of liquids through capillary spaces is attended by the development of electro-motive forces and according to Graham a chemical action on the material of the septum invariably accompanies osmotic action. These osmotic processes, therefore, which are constantly going on in all parts of the normal living body, cause differences of electric potential on the surface of their partition walls and electrolytic action is in all probability the result.

These conditions are peculiarly modified by a constant current introduced from without. The natural endosmotic current may be quickened in its flow by the aid of an electric current flowing in the same direction, that is, from positive to negative; or natural osmosis may be retarded or checked by an opposing electric current. These phenomena, due to the influence of a constant electric current in modifying the ordinary processes of osmosis, are what is meant by electric-endosmose, or, when applied to animal tissues, cataphoresis.

The numerous experiments of De la Rive established the following generalizations regarding electric-endosmose:

"The force with which a galvanic current transports a liquid through a porous partition from the positive to the negative wall is measured by a pressure which is directly proportional to the intensity of the current, to the electric resistance of the liquid; to the thickness of the porous partition and inversely proportional to the surface of that partition."

These conclusions serve as guides to our therapeutic methods, when we come to make use of these physical processes in the treatment of diseased conditions, for by heeding them we form a more correct estimate of the strength of current, and the size and nature of electrodes required for special applications.

Morbid states within the body may be modified by cataphoresis either directly or indirectly. The power we have, through the use of the galvanic current, to drive fluids and substances dissolved and held in suspension in them, away from the positive electrode and transport them to the vicinity of the negative electrode is one which, when it becomes more fully apprehended by the medical profession, is destined to play an important role in therapeutics. By means of it morbid accumulations of fluid in serous and synovial sacs may be driven out, rheumatic and gouty deposits may be redissolved and removed, congestions may be made or allayed and conditions may be estab-

lished at the will of the skillful operator that will effect decided changes for the better in the local or general nutritive processes. This may be properly termed the direct use of the cataphoric action of the current and is what Prof. Houston has chosen to designate normal cataphoresis, while that for which he suggest the name of abnormal cataphoresis is what we refer to as the indirect therapeutic application of the principles of electric-endosmose. By indirect cataphoresis we mean the employment of it for the purpose of conveying medicines in solution into the body through the integument or mucous membranes by bringing them in some manner into the channel of the electric current at the positive pole and so causing them to penetrate these membranes.

This can be made to serve the purpose of both general and local medication; general, when for any reason it is deemed best to make the skin the avenue of ingress for such medinces rather than the alimentary canal. Many remedies can be carried into the system in effective quantities through the pores of the skin by cataphoresis that, without its aid, would find in the various layers of the integument an impassable barrier. Thus by making the body, immersed in a medicated bath, the negative terminal of a suitable constant current, the medicated solution surrounding the body being rendered positive would insure a certain per cent of the medicine gaining entrance to the subcutaneous tissues. We do not know to what extent so-called "electric baths" have been given in this manner and with this purpose at our sanitariums and hydropathic establishments, but it is capable of being made an efficient method of systemic medication for all electro-positive substances that possess curative properties, such as many of the soluble alkaloids or soluble combinations of these. The constituents of our natural mineral waters, of which we have such a variety in this country, might be studied with the view of increasing their medicinal action by this method of introduction. The direct action that could be brought to bear upon the deeper layers of the skin by this means naturally suggests itself to our minds and in affections such as those in which sulphur and arsenic are so largely employed as remedies, the deeper layers of the skin, where the pathological process is seated, could be effectually treated by this method should a soluble salt of one or other of these remedies be dissolved in the bath.

For the local medication of an organ, joint, nerve or gland it is only necessary that a suitable electrode be devised in order to secure the effect desired with a remedy that can be used in this way.

Cocaine anæsthesia, which cannot be brought about by topical application of the drug to the skin, is quite effectual when induced cataphorically. And the local effects of veratria, aconitia, menthol and a variety of other remedies used to dull the sensibility at nerve terminals, are greatly intensified if applied by this method.

It has been suggested by Dr. W. J. Morton that cataphoric action might be employed with advantage for *demedication* of the system as well. When by any means the tissues have been the receptacles, either by accident or design, of deleterious agents, such as lead, arsenic or phosphorous, a reversal of the electric current might, in a suitably arranged bath, aid in their removal.

CATALYSIS.

It is due to the teaching of R. Remak, previous to his premature death in 1865, that the word catalysis found a place in electro-therapeutics. It was em-

ployed by him as a conveinent term under which to include the various processes, partly demonstrable and partly theoretical, which attended the application of the direct or galvanic current to diseased tissues and which often resulted in a restoration of normal function. These processes, we are now prepared to believe, are of a complex nature. Certain of them we know to be physical, while others are physiological. We have endeavored in preceding articles to direct attention to some of the actions which are always present to a greater or less degree in the tissues of a living animal organism whenever a direct electric current is passed through them. Thus we have discussed electrolytic, cataphoric, contractile, and electrotonic action each of which has its part to pay in bringing about the improvement that has been clinically demonstrated over and over again in therapeutic applications of the direct current.

But no one of these classes of action nor all combined are sufficient to account for the permanent benefit which the employment of such currents in therapeutics affords. It is assumed therefore that there are a variety of effects not yet experimentally demonstrable but still theoretically quite probable, that follow from the passage of the current in addition to these that can be readily observed, and it is both these known and assumed actions that the word catalysis is intended to cover.

When we were considering the electrolytic action of the direct current and the polar phenomena due to it and the therapeutic applications of this polar action both anodal and cathodal, intimation was given that electrolytic effects occurred in all probability, at points in the tissues remote from either pole or electrode but in the course of the current between them. The separation of the ions at the electrodes must of necessity cause some change in the molecular arrangement of the substances which give up those ions. In a liquid of simple composition with a uniform resistance throughout it, that which occurs is generally explained by the theory of Grothüss or Clausius which assumes that the interpolar molecules remain the same in composition but that by reason of the loss of atoms at the electrodes by electrolysis the atoms of these intermediate molecules are forced to change partners and so a rearrangement takes place all along the line. This is very simple and easily understood when we are considering a liquid substance of simple composition, as water, but what may occur by reason of the passage of an electrolizing current through the exceeding complex solutions and varying resistances met with in the tissues of a living animal organism is not so readily followed.

A simple experiment may serve to illustrate the first step in this intermediate whirl of activities. Let as many as six or eight small beakers be taken and each be partly filled with a neutral solution of sodium sulphate; then add a few drops of an alcoholic solution of phedol-phthalein to the contents of each beaker. Arrange the beakers in a row and connect the fluid in them by bits of copper wire. Into one terminal beaker insert the anode of a continuous or direct current circuit and into the other terminal beaker the cathode. If the current which passes has but the strength of one milliampere a violet discoloration will soon be observed about the tip of copper wire in each beaker which lies nearest to the cathode and which is, in fact, the cathode for that cell or beaker. This color indicates that the sodium sulphate has been decomposed and the soda set free at the cathode has reacted upon the phenol-phthalein; a

double chemical action, one destructive, followed by another that is constructive, occurs in each cell as a result of the presence of the electric current.

It is no imaginary conception that is indulged in when a resemblance is pointed out between this simple arrangement and the conditions present in the tissues of an animal organism. The fluids in the latter may be more complex and the connections between them, that is, the various tissues—may be better or poorer conductors than the bits of copper wire, but with the exception of a much greater complexity in the composition of the electrolytes and the intervening conductors the conditions remain essentially the same. If electrolytic decomposition is not seen to take place it is either because we have not known how to seek for it or because the reconstructive chemical or vital combinations have taken place so promptly as to hide the first steps in the process. It is therefore only from the ultimate physiological or therapeutical results that we can form an estimate of what occurs in this secret laboratory.

Cataphoric action also leads to secondary processes. It aids in conveying liquids and the substances dissolved in them into and away from tissues and although we cannot yet say in any particular pathological condition just what the secondary chemical, mechanical or vital changes are which the cataphoric action induces, yet it must appear evident that the change in conditions that it brings about must result in something different from what would have been the case had the cataphoric action not been employed.

So with the direct and indirect physiological reactions which the current occasions in living animal tissues, each one, muscular contraction, nerve stimulation or sedation, and the excitation of cell protoplasm is attended by a train of sequences which have their part in modifying nutrition.

Trophic changes may be directly set up by action upon the cell contents or indirectly by modifying the conditions under which nutritive activities are carried on. Until the organic chemist, the physicist, the physiologist and the pathologist can trace out for us the intermediate steps through this labyrinth of activities which lies between the first effects that we can demonstrate as resulting from the application of a direct current to living tissues and the final results which clinical and physiological evidence though somewhat conflicting in details, still positively assert follow from such applications, as the increase of growth, increased functional activity, removal of abnormal deposits, etc., we will find it convenient to refer to this series of changes under the one comprehensive term *Catalysis*.

POSITIVE ELECTROLYSIS.

By positive electrolysis is meant electrolytic action as brought about at the positive electrode or anode, while negative electrolysis refers to the effect produced by means of the negative pole or cathode. Electrolytic action upon living animal tissues in immediate contact with the electrodes admits of no question. The drying, coagulating effects that follow the application of the anode and the softening, liquefying influence of the cathode are too well known and too readily demonstrated to be long an occasion for doubt. These immediate polar effects of the constant current have been the means of accomplishing much in electro-therapeutics.

Whenever vascular derangements occur, giving rise to abnormal dilatations such as nævus; circoid or other aneurisms, varicose veins and such like

conditions, the coagulating action of the anode can be brought to bear upon the faulty vessels with a precision and freedom from unnecessary damage that commends it as superior to all other procedures. Where hæmorrhages and ulcerations are due to relaxed and boggy conditions, as is frequently the case upon the cutaneous surfaces or accessible mucous membranes, the application of the anode promptly corrects the morbid state. Varicose and phagedenic ulcerations; eroded surfaces retarded in healing by excessive granulations; mucous surfaces congested and abnormally vascular or studded with vascular vegetations, as is so often the case in the nasal passages, the pharynx, the uerthra, and in the interior of the uterus; in fact all abnormal local conditions where astringent measures are indicated present suitable conditions for the use of the anode of the continuous current.

If these abnormal conditions arise upon an accessible surface, either cutaneous or mucous, a variety of suitable electrodes are constructed by which to make application of this anodal electrolytic property of the current. These should be of metal that is not corroded by the nascent elements set free at the positive pole during the passage of the current, such as oxygen and chlorine. Platinum, gold, or carbon serve this purpose best. If, however, it is desired that the therapeutic action of certain secondary products that can be generated electrolytically at the anode be utilized, then the composition of the electrode may be of such material as will give rise to these products. Pure copper and pure zinc have thus been employed as electrodes for anodal applications, whereby much of the therepeutic effect resulting is due to the action of the oxides and chlorides of these metals generated at the point of application, and caused to penetrate the adjacent tissues by the action of the current (cataphoresis). Some of these metallic salts are germicidal, and where the deranged state of nutrition makes a suitable culture field for the generation of bacteria. and thus prolongs the pathological process, metallic electrolysis proves a therapeutic procedure of superior excellence.

This astringent and germicidal action of the anode of a constant current is of peculiar advantage in dealing with such conditions when located in the urethra as gonorrheal inflammation, in the cervix uteri, and in affections of nasal and pharyngeal mucous membranes. Various parasitic skin diseases also affecting the sebacous and hair follicles can be treated successfully by means of needles of pure copper, employed in positive electrolysis. There are circumstances, however, where the formation of metallic salts and their deposit in the tissues as a result of positive electrolysis might prove objectionable. Should an operator attempt the removal of superfluous hairs, or other blemish, on an exposed surface of the body by means of a steel, copper or other corrodable metal as the anode, the metallic salt formed would leave an indelible pigmentation at the point of operation. For this reason negative electrolysis is usually employed when it is desirable to avoid this effect.

NEGATIVE ELECTROLYSIS.

When the negative electrode of a continuous current is brought into contact with living animal tissue, hydrogen and the alkaline elements which enter into the composition of those tissues are set free in immediate contact with the electrode. When thus liberated they may, if in sufficient amount, react injuri-

ously upon the adjoining tissues. Caustic soda and caustic potassa are two forms of alkali most likely to be formed, and these again combine with fats and albumen and form soluble compounds. The quantity of alkali thus gathered at the negative electrode is directly proportional to the strength of the current and to the length of time it is passing. A small current allowed to act on tissues for a long time will have an effect equal to a greater amount of current during a less time. The amount of current and the length of time during which it is permitted to flow through a part must be determined by the effect desired. Gress destruction of tissue can be caused either by positive or negative electrolysis. The eschar resulting from positive electrolysis is dry and hard, while that resulting from negative electrolysis is soft and pliable. The latter is better adapted, therefore, for that class of therapeutic applications where it is not desirable to limit the blood supply or nutritive channels in the part after the effect has been accomplished for which the electrolytic application is made. In removing superfluous hairs, warts, moles, and other nonvascular growths, negative electrolysis is the more suitable procedure, especially since it is not necessary to employ with this pole a non-corrodable electrcde, there being no possibility of staining the tissues with metallic salts in using a steel point when the negative pole is employed for this purpose. As many of these operations are made for cosmetic effects, these are points that should not be disregarded.

But the therapeutic effect of negative electrolysis is not limited to those procedures where actual decomposition of tissue takes place, or at least where such destruction is noticeable to the naked eye Cicatricial tissue, arising from a variety of causes and located in various places, oftentimes assumes grave pathological importance. Function may be seriously impeded by it, whether it has resulted from traumatism, burns, scalds, acid erosions or inflammatory action. It has been found that negative electrolysis which stops short of surface destruction of tissue has the power to soften and relax this fibrous, or scar tissue, and thus remove or mitigate the evil effects which its presence has caused. This result may not be justly attributed to electrolytic action alone, for no doubt the process termed cataphoresis contributes a share of the influence, and the vital forces residing in the part cannot be left out of the account. But while we are unable to justly proportion to each agency its proper share in the process, it is nevertheless true that negative electrolytic action starts a retrograde metamorphosis, or change, in the dense fibrous network of cicatricial tissue, which causes it to soften and relax. This can be done without bringing about any gross destruction of tissue, or producing eschars. It is a misuse of this method of treatment to employ currents strong enough, or long enough to cause erosions. The relaxing and changed nutritive effects produced on cicatricial tissue under the influence of the negative electrode do not require such strong currents. Wherever, therefore, through inflammatory or other agency, such scar tissue has become a serious impediment to function, as in stricture of canals and passageways, such as the œsophagus, urethra, cervical canal of the uterus, etc., negative electrolysis will oftentimes prove a valuable means for affording relief by resolving the tissue that occasions the constriction. Abnormal growths closely allied in structure to cicatricial tissue, such as fibroma and uterine myoma, are also amenable to negative electrolysis, and it is through its agency that Apostoli and his followers have achieved their successes in the electric treatment of this class of growths.

CURRENT DENSITY.

When treating of positive and negative electrolysis in a former number of the Bulletin, we indicated the therapeutic effects that could be obtained on tissues by concentrating the current by suitable electrodes either at the anode or cathode.

The object of the increased density of current at the point of application in these cases is to disintegrate the tissue in immediate contact with the electrode. Such destruction of tissue will take place whenever and wherever the electric energy is in quantity and intensity sufficient to disrupt the chemical combinations of which the tissues are made up. But while this destruction and decomposition of tissue is the result sought in some therapeutic applications, it is very undesirable in others. When the application is made with the view to secure therapeutic effects deep within the body, and influence the nutrition or effect a change in the composition of the fluids or tissues of an organ remote from the skin which overlies it, precautions must be taken to prevent the current from doing damage along its pathway as it is conveyed to the disordered region.

The greatest obstacle to the introduction of a constant current to structures beneath the skin is the skin itself. In its dry state the skin offers enormous resistance to the passage of the current, and the electric energy which is applied to it is largely expended upon its surface unless measures are taken to reduce this resistance. The skin's resistance can be greatly reduced by keeping it thoroughly moistened with saline solution, and the destructive effects of a concentration of electric energy upon it can be avoided by using broad electrodes at the points of application. A lack of knowledge of these conditions, or a disregard of them, has been the cause of much bad work in electro-therapy. The operator, in using a constant current, is inexcusable for producing an accidental eschar.

At the point of contact of the electrode with the integument, the section of the circuit is determined by the active surface of the electrode. Consequently the density of the current at this point varies with the active surface of the electrode employed, and in an inverse ratio. In order that the electrode may be uniformly active over its entire surface in contact with the skin, it should be evenly and thoroughly covered with some material capable of receiving and retaining moisture. Should a portion of the electrode during the treatment be allowed to come in immediate contact with the integument, owing to the better conductivity up to this point, the density of current would be increased upon this spot of integument and electrolysis of the skin might result. Or again, should the material used for covering the metal or carbon electrode be moistened imperfectly, the density of current would be greater at these spots on the skin in contact with the well moistened parts of the covering, and thus density might be sufficient to cause disintegration of the skin.

We possess no absolute values of density to serve as a point of departure in these applications of constant currents to the deeper structures of the body. There is great variation of resistance offered by the epidermis in different patients, and in different parts of the body in the same patient. A current bordering on a destructive degree of density usually gives rise to pain, oftentimes to severe pain, before much electrolytic action has taken place; and yet this is

not a safe guide to the operator even if he should choose to subject his patient to the test, for there is the greatest variability in patients in their sensitiveness to pain. Moreover, the disease to be treated may be one associated with cutaneous anæsthesia where the pain signal is wanting.

In addition to this, another difficulty presents itself in any attempt to establish a unit of density for electro-therapeutic work. A density which suits a current of certain strength, and with an electrode of given surface, is much too great for a stronger current and a larger electrode. Thus, if an electrode having 1 sq. cm. of surface can remain applied during ten minutes with a current of 1 ma., it is not to be inferred that another electrode twenty times greater could remain applied during the same time with the same density, that is to say, with a current of 20 ma. To employ this strength of 20 ma. without causing pain and without danger of scars, it would be necessary that the smaller electrode should have a surface of about 115 sq cm. Without electrode of only 20 sq. cm., the strength of the current should not exceed 7 ma. for an application of ten minutes; and the density is then 0.35 of a ma. per sq. cm. This shows that in medical practice the value of the electric density cannot be absolute, and that this value should diminish as the strength of the current augments.

Boudet de Paris sought to establish experimentally the value which may be given to the density with electrodes of different surfaces, and for currents of a strength varying from 1 to $25~\mathrm{ma}$. The results of these researches are embodied in the following table :

Electrode Sur- face in sq. cm.			Current in Milliampéres.	Electrode Surface in sq. cm.				Current in Milliampéres.
1	will safely c	arry	1.	24	will safely	carry		. 7.75
2	11 11		1.50	25				. 8.
ã	4.1 4.5		2.	26		16		. 10.
4			2.25	50	4.1	1.6		. 15.
2 3 4 5.	11 11		3.	75	**	6.6		. 18.
6	61 61		3 50	100	11			20.
	.1 41		4.	125	4.4			. 21.
7 8	41 41		4.25		4.6	6.6		. 22.
9	61 41		4.50		6.6	4.1		. 22.5
10	6.6 4.6		4.75		6.5			. 23.
11	11 41		5.	225	1.4			23.3
12	4.6 4.4		5 25		1.4	6.6	* * * * * * * * *	23.6
13	44 11		5.50				• • • • • • • • • • • • • • • • • • • •	. 24.
14	4.1 4.4		5 75		(1			24 3
15	41 61		6	325			• • • • • • • • • •	
16			6.25					
17			6.50			1.4	• • • • • • • • •	. 24 6
18	11 11		6.75		4.1		• • • • • • • • •	. 24.7
19			6.90			1.4		. 24.8
20	61		7.	450		61	• • • • • • • • • • • • • • • • • • • •	. 24.9
21	16 66	********	7.15			1.1		. 25.
22	11 11	* * * * * * * * * * * * *	7.10					25.
23	41 61		7.25		4 4	1.6		. 25.
40			7.50	i				

The values given should be regarded as means, but as his researches extended over a large number of patients, and consequently on integuments differing in resistance, there is reason to consider the estimates as fairly precise, and, as far as we know, this is the only attempt that has been made by any electro-therapeutist to determine the limit of density of a constant current that can be passed through the integument without doing injury to it.

THE CONSTANT CURRENT IN THE TREATMENT OF ENDOMETRITIS.

The continuous current may be made to play an important role in the treatment of endometritis. Looking into the etiology of this disease, we find we have an Inflammatory condition due to the action of microörganisms in an organ whose power of resistance has been lowered. In consequence we have pain, a leucorrheal discharge and menstrual disturbances. Applying the action of the galvanic current, especially the anodal action, to this etiology and to these symptoms, we find the one answers to the other point for point. In the first place, we have here an antiseptic and germicidal application for a disease of ascertained microbic origin, coëxisting with an agent which may stimulate the circulation of the part and thereby relieve stasis in the inflamed organ. Arterial blood is thus brought to improve the nutrition and restore the normal resistance of the part. This current is sedative, relieving pain both uterine and ovarian; it constructs and tones up the glands, thus lessening the leucorrhœa.

The method of application is simple. The negative electrode should be a broad one, of metal (zinc, wire gauze or perforated brass), well covered with amadou, sponge, lint or clay, and thoroughly moistened in a warm salt solution. The positive may be any medium-sized intrauterine electrode. It is better to be slightly curved, cylindrical and of copper, zinc or platinum, according to the effect desired.

With the patient on the table and the speculum in place, remove the secretion from the cervical canal, introduce the positive electrode into the cervical canal and put the negative electrode under the patient's hand or upon the abdomen. When all is ready turn on the current carefully and gradually, so as to avoid all shock. When the desired strength of current is obtained, rotate the electrode gently to avoid electrolytic erosions, and let the current pass from five to six minutes. The strength desired in these inflammatory conditions varies from 10 or 15 ma. to 30 or 40 ma. With a new patient it is always necessary to begin with a weak current, so as to allay any nervousness or apprehension. Remove the current gradually, and afterward carefully cleanse the canal again, making application of such medicinal agents as are indicated.

The treatment should be repeated three times a week, and if there is dysmenorrhœa, before each period it is well to employ the negative electrode in the uterus.

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ELECTRICITY IN DYSMENORRHEŒA.

A Lecture delivered at Post-Graduate School in March, Special Course, 1895.

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No one remedy can be expected to cure dysmenorrhoea because dysmenorrhoea is a name applied to a symptom of several pathological conditions. No one remedy, however, in medicine or surgery, in its several manifestations, has so valuable and almost universal application as a curative agent for the pathological conditions giving rise to painful menstruation as has electricity.

ELECTRICITY.

The galvanic or the direct current and the faradic or the alternating current are the two forms which find large fields in this branch of gynecology.

PHYSIOLOGICAL EFFECTS.

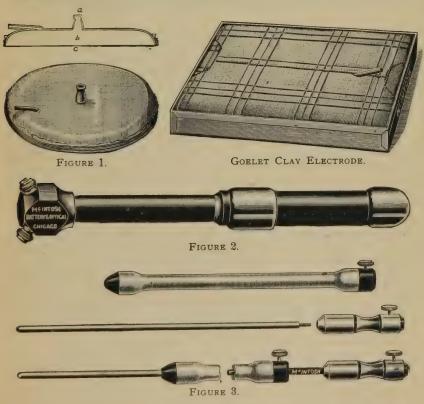
The effects of the direct current, like that of the faradic current may be divided into local polar action and general systemic effects. The polar effects employing a soft copper sound in one of the hollow organs of the body like the uterus, for the active electrode, as the positive pole, with a current varying from 10 to 25 ma. for each cm. of active surface can be summarized as follows: (a) On local nerves, sedation; (b) on local blood vessels, vaso-constriction; (c) result of electrolytic action, attraction of acid radicals of the disorganized tissues; (d) on local tissues, hardening from coagulation of albumin; (e) on pathogenic microbes—destruction; (f) on fluids in the tissues, propel toward opposite pole or cataphoric action; (g) effect of electrolysis on copper electrode, acids of the tissues form copper salts which are driven into the tissues by cataphoresis.

For the negative pole (a) on local nerves, irritation; (b) on local blood vessels—vaso-dilation; (c) result of electrolytic action—attraction of alkaline radicals of the disorganized tissues; (d) on local tissues—softening and liquefaction from effect of the alkaline; (c) on pathogenic microbes—destruction; (f) on fluids in the tissues—attracts them; (g) effect of electrolysis on copper or other metal electrodes—little or none.

The general or systemic effect of the galvanic current apply equally to both poles. (a) It is a powerful promoter of general nutrition; (b) it is a powerful stimulant; (c) its inter-polar effect when powerfully concentrated is such as to promote absorption.

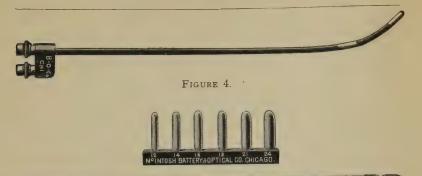
The effect of the faradic or alternating current is more of a mechanical nature. As the current is an alternating one polarity cannot be taken into

consideration. Its effects varies much with the relative frequency of the alternations or interruptions. (a) If the interruptions are of high frequency it acts as a sedative; (b) if the alternations or interruptions are slow it exercises the muscular tissue by causing alternation of contraction and relaxation of its fibers; (c) the systemic effects of the alternating or faradic current are similar to those described for the direct current, if anything of a higher degree. Through claims of peculiar results with currents generated by a faradic apparatus consisting of coils of wire of different sizes, we have been led to believe that for muscular development we should employ a coarse wire coil, while for relieving pain we should employ a fine wire coil. Batteries are, therefore, now constructed in which these two requisites are provided, together with an automatic interrupter which may be regulated for rapid or slow interruptions.



ELECTRODES.

Few and inexpensive electrodes are necessary for the proper electrical treatment of gynecological difficulties. The essentials consist of (1) An abdominal electrode. The cheapest and one of the best of these is the clay electrode, as prepared by Goelet. The most elegant, while more expensive, is the Martin



membranous abdominal electrode: Fig. 1. (2) A bipolar vaginal electrode. This may be employed either as a unipolar or a bipolar instrument: Fig. 2. (3) Set of copper block tin or platinum intrauterine electrodes of three sizes—3, 5 and 7 mm. in diameter. (4) Martin's flexible intrauterine electrode three-one-hundreth size: Fig. 3. (5) Intrauterine bipolar electrode: Fig. 4. (6) Urethral staff with graded conical bulbs. (7) Bipolar rectal electrode.

DYSMENORRHŒA.

Dysmenorrhœa or painful menstruation is a symptom arising from one or more of several pathological conditions, and these pathological conditions may be considered under the three following grand divisions: (1) Obstruction. (2) Inflammation. (3) Neuroses.

OBSTRUCTIVE DYSMENORRHŒA.

When an obstruction exists of ever so small a degree in the uterine canal, pain is an accompaniment of the menstrual flow. I will not argue the point with those who wish to theorize on the actual cause of this pain. I care not, and the patient cares less, whether the pain in these cases is caused by the accumulation of menstrual blood above the slight obstruction, followed by a violent contraction of the uterus to force the obstruction, or whether the pain is caused solely by an obscure nervous phenomenon. The pain certainly resembles that which accompanies the clonic contractions of the uterus when that organ is making an effort to empty itself of a foreign substance; therefore, it has naturally become known by the name obstructive dysmenorrheea.

The causes of obstructive dysmenorrhæa which yield to electricity are (a) nondevelopment of the uterus; (b) flexions; (c) strictures.

Nondevelopment of the uterus is frequently the cause of dysmenorrhea in young women. The cause is usually traced to overwork at the time of puberty, either mental or physical. Mental overwork is usually found among girls of the better class, of ambitious dispositions, who are endeavoring to break records at school. The body is neglected; sleep and exercise are banished; all of the organs of the body are stagnant, while the brain and nervous centers are being overcultivated. This acts as a powerful derivative to all of the organs of the body outside of the skull, and especially to the organs of repro-

duction which have never been called into exercise. These organs therefore having been entirely ignored during the natural period of development are loath to begin development when these abnormal conditions are finally removed, and, so, frequently an overworked girl will go suffering through the early part of her life because of this unfortunate neglect during a year or two of her school life.

On the other hand, we get the same result in girls who are overworked physically. Excessive muscular work in poor hygienic surroundings, where the blood is thin from improper and inadequate food, where the blood is vitiated from imperfect oxygenation; hard muscular exercises under these circumstances requires that the little poor blood which circulates through these girls should be exhausted in its effort to supply the wasted muscles, leaving little for such organs as those of reproduction. Thus we get the same derivative effect and the same painful result.

The pain is of a severe spasmodic nature which can best be described as resembling labor pains. They vary in severity from slight discomfort to pains which from their severity frequently render the patients unconscious. They vary in number from one or two at the beginning of the flow to severe pain every five or ten minutes from twenty-four to forty-eight hours. The pain is usually most severe at the beginning of the flow and gradually lessens and disappears altogether on the second or third day. Ordinarily there is not much pain between the spasms of uterine contractions. Occasionally the interval is filled with an aching pain in the uterus due to the general soreness, and occasionally with severe aching pains in the ovarian regions. The flow varies in amount, frequently scanty, although occasionally excessive.

Local examination shows the uterus small, and of a shape varying markedly from the normal. The cervix is usually pointed, long, and lying with its axis corresponding with that of the vagina with os small at the extreme end of the point directed toward the mouth of the vagina. The cervix is flabby, soft, without muscular stiffening; and in color pale. The body of the uterus is also small and soft and flexed forward to such a degree that its axis is frequently at right angles to the cervix. The whole organ is easily movable and the appendages ordinarily normal.

While the foregoing describes the majority of these cases, occasionally the uterus is not flexed anteriorly, but posteriorly, and rarely it is not flexed at all. It is long, flabby, and lifeless, and nearly devoid of muscular structure in almost all of these cases. Usually the wall of the uterus corresponding to the concavity of the flexure is thin owing to pressure atrophy at that point.

TREATMENT.

The indications for treatment here are plain. The uterus must be unflexed and the organ must be developed muscularly. The form of electricity which should be selected for such a case is plain. It should be the faradic or alternating with slow interruptions. According to Apostoli the current, if from a faradic machine, should be from the coarse wire secondary coil. In order that the whole influence of the current should be concentrated in the uterus a bipolar intrauterine electrode should be employed. In order that the uterus should be first straightened as a preliminary to each treatment, and retained

in its normal straightened condition while the influence of the electricity is being exerted, it is well to employ an electrode which is either elastic, so that after its introduction it will constantly exert an influence in the right direction, or one that is of sufficient pliability that it may be properly shaped before its introduction.

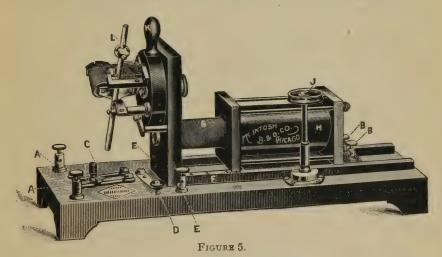
After selecting an electrode then, with such an idea in view, it should be carefully introduced into the bent uterus well beyond the flexure into the body in such a position that one pole will exert its influence on the body and the other on the neck, thus encompassing the whole uterus in the circuit. While these uteri are ordinarily acutely flexed, it is a comparatively easy matter usually to insinuate the electrode through its soft canal. After the electrode is inserted the two poles of the battery should be attached and with the two coils entirely separated so that there will be no current when the noise of the machine begins, it should be started. Fig. 5. Then the coils should be gradually telescoped until a strength of current is reached as strong as the patient will bear without pain. The interruptions should be slow, as one or one and a half a second. The time of treatment should be five to ten minutes. The frequency from every day to two a week. The current can frequently be increased in strength after it has acted a short time without increasing the discomfort of the patient, as it has a benumbing influence on the nerves of sensibility. It is desirable to give a pretty strong dose, although the treatment should not be allowed to become painful. This treatment will almost invariably relieve the most aggravated dysmenorrhœa of this type after one month's To establish a cure it should be employed until the uterus develops a normal size and condition. It will soon begin to fill out. The neck will contract in length as it increases in diameter from its containing more muscular tissue. The flexion will grow less as the result of the muscular tube stiffening with new growth and the atrophied spot due to the pressure has taken on normal development. I have frequently been able to demonstrate in the clinic the marked effect of this treatment, when a long, pointed-necked, flabbywalled pale colored flexed uterus has changed in a few weeks to a plump normal organ. The effect on the general health in these patients is remarkable. The nervous system is toned. Appetite increases; pelvic lethargy disappears, as demonstrated by normal movements of the bowels, subsidence of vesical irritation and relief of sacralgia. The blood grows red; the mental organs which have been harrassed with pain and half nourished by impoverished blood, begin to take the initiative, and despondency gives place to cheerfulness.

STRICTURES

Dysmenorrhœa produced by strictures of the uterine canal is of the same character symptomatically as that produced by nondevelopment. In other words, its manifestations are such as to apply obstructive dysmenorrhœa to it.

Strictures of the uterine canal are most often found at the external, or at the junction of the neck with the body. They result from inflammation of the endometrium, lacerations or other traumatisms, and from improper local treatment, or from improper surgery. Endometritis produces stricture of the uterine canal in much the same way that strictures of the uterine are produced

by urethritis. Inflammatory action causes hypertrophy of the submucous and mucous tissues, which of necessity causes those tissues to encroach upon the caliber of the canal. Cicatricial formations following lacerations or other traumatic injuries of the uterus cause frequently irregularities and contractions of the caliber of the uterine canal. Cauterizing of the uterine canal as a form of treatment has frequently produced strictures of that tube by cicatricial contractions, and also by the union of surfaces denuded by the caustic. Improper surgery, as too close closure of a laceration of the cervix, is an occasional cause of stricture of the external os. Thus the strictures are, strictly speaking, actual organic narrowings of the uterine canal, and are to be distinguished from constrictions caused by the flexing of a tube of normal caliber In order to enlarge these strictures it is necessary to produce an absorption of



the abnormal tissues which have encroached upon the tube. It will not do to cauterize a hole through, as that will destroy the integrity of the normal mucous membrane and leave a condition which in the end will aggravate the difficulty. Cutting the stricture does not insure against subsequent union and a continuance. Dilatation, gradual or at one sitting, is usually followed by relapse. In the negative pole of the galvanic current, however, do we get one of the most satisfactory remedies for strictures of the uterine canal. It produces absorption of the adventitious products entering into the formation of the stricture without at the same time producing a corresponding destruction of normal tissue. It acts here as it acts in strictures of the urethra. It is painless, easy of employment, nonsurgical in appearance, rational in its action and sure in its results.

The shape of the uterus is ascertained by bimanual examination. A urethral staff is moulded, by first heating it, to conform in shape to the direction of the uterine canal. An olive point is attached to its end, which is a little larger than the strictured portion of the canal. An abdominal electrode is

attached to the positive pole of a battery, in the circuit of which is a milliampère meter; the urethral electrode is attached to the negative pole. The electrode is now inserted into the canal, guided by the index finger of the left hand, until the bulb point is inserted by the stricture, the current is now turned on of five to eight milliampères, while slight pressure is exerted on the electrode. It will soon pass an ordinary stricture if the bulb is not too large. The bulb should not be more than one-half millimeter larger than the caliber of the canal. After the stricture is passed, with the current still on, the electrode should be gradually withdrawn through the stricture, when the current should be shut off and the treatment ended. At the next sitting, two days in advance, a bulb one size larger should be employed, and so on each second or third day until the stricture no longer exists. A small canal can be permanently enlarged in two or three weeks treatment. A current should never be employed for his purpose with so small an active surface as that represented by one of these bulbs, of a strength to exceed ten or twelve milliampères for the largest bulbs, while the average current should be about eight milliampères.

INFLAMMATORY DYSMENORRHŒA.

Endometritis.—Endometritis often complicated with metritis is a frequent cause of dysmenorrhea. It produces two kinds of pain. First a dull aching pain in the uterus which comes on several days before the flow appears and gradually becomes less as the pelvic organs become depleted by the continuance of the flow, so that it has usually disappeared before the menstruation ceases. Second, irregular pains characteristic of uterine obstruction which usually begin with a severe pain at the beginning of the flow and gradually shades off as the flow is thoroughly established. The cause of the dull pain which begins as menstruation is approaching in these cases is the result of the aggravation of the endometritis by the increase of blood flowing to the uterus in preparation for the monthly discharge. This congestion aggravates all the symptoms of the endometritis or metritis until the increased blood supply is diminished by the beginning of the regular flow. The pain is referred to the uterus and is described as a nervous aching, the nervous element being disseminated because of the intimate connection of the uterine nerve supply with the whole outer organism.

The cause of the symptoms of obstructive dysmenorrhœa as an accompaniment of the other characteristic pain of endometritis is the obstruction of the canal by the swollen endometrium. As the pelvic organs become congested at the approaching period the endometrium, already swollen and congested, becomes excessively swollen, and in addition to producing the aggravating steady pain from the pressure of its opposing surfaces, it also obstructs by its opposing surfaces the free exit of the menstrual blood when it begins to flow. It therefore accumulates until the uterus is stimulated to response when a terrific contraction follows, the obstruction is forced, and pain of a severe degree is experienced. This continues every five or ten minutes, each succeeding contraction being less violent as the congestion is gradually relieved by the flow until it disappears altogether.

Electricity is a remedy of great value in these cases. Galvanism is indicated and applied by an intrauterine electrode with the positive pole. A pure

copper sound is selected with a proper insulating sheath, the sound being of a diameter which will admit of its being easily inserted to the bottom of the endometric uterus, while at the same time it should be sufficiently large to quite effectually fill the canal. After properly shaping the sound so as to make it conform to the curve of the uterus, it should be inserted to the bottom of the canal and the insulating shield pushed against the cervix. It should now be attached to the positive pole of the battery, and an abdominal electrode attached to the negative pole should be placed upon the abdomen. A current of from 50 to 100 milliampères should now be gradually turned on and allowed to act from five to eight minutes, or about five minutes for the maximum current employed. The current strength required should be regulated by the active area of the active pole. It should be as near 25 ma. for each sq. cm. of surface exposure, as the patient will tolerate without positive discomfort. As a rule, there is little pain if the current is applied and withdrawn by gradual gradations.

The effects sought here are as follows:

- 1. The mechanical effect of inserting a sound which quite fills the canal two or three times a week for a month insures drainage for the uterus.
- 2. The positive intrauterine galvanism (a) acts as a local sedative, (b) contracts local blood vessels, (c) dries the endometrium by attracting the acids through electrolysis, (d) acts as a powerful antiseptic, (e) still further dries or depletes the tissues by cataphoresis, (f) tanning of the tissues by the salts of copper formed by a combination of the ions of the positive pole with the soft copper of the electrode.
 - 3. The general systemic tonic effects of the galvanism.

When we can demonstrate almost every one of these actions of electricity on the uterus by ocular demonstration, can any one ask how does electricity cure endometritis? Can any one ask for a remedy that is more elegant in its application; one that is less painful? Do we know of any one remedy which drains, depletes, medicates, sedates, destroys pathogenic microbes and acts as the best general tonic, all at the same time, and which may be applied as one of the least objectionable of local treatments? I know of none. These applications should be made two or three times a week. The patient should employ a hot douche of alum water every night, and a hot bichloride douche followed by a plain one each morning before treatment. A small piece of absorbent wool or cotton may be placed in the vagina following the treatment, as a support as well as an absorbent. I have never seen a case of dysmenorrhœa of this type (when the condition was uncomplicated) fail to yield to the first month's treatment. There is nothing to which I feel justified so much, in positively promising a cure as for this condition by the foregoing remedy. The cure is usually established in from one to three months according to the severity of the inflammation, the number of treatments, and the controllability of the patient.

Ovaritis and Salpingitis.—The pain characteristic of dysmenorrhœa, of which the foregoing inflammation is the cause, is of a dull aching character, located laterally to the uterus, beginning before the flow commences and frequently lasting with great severity for a number of days following menstruation. As the conditions producing this variety of pain are frequently suppurative diseases of the appendages one must have his diagnostic power well about

him before employing electricity for its relief. Because I want my hearers to put it down conspicuously in their ''don't books,'' don't employ electricity in any form, in the pelvis, when suppurative diseases of the appendages exist. Therefore when this variety of pain is described in the history of any case, examine carefully and make a positive diagnosis before instituting any form of treatment. When therefore these pains are present, examine carefully with an anæsthetic, if there is the slightest doubt without it, and eliminate pyosalpinx or ovarian abscess. If they do not exist you will probably find small tender tubes or slightly enlarged ovaries, freely movable in the sides of the pelvis. If you could examine those tubes by ocular means you would find them red, congested and slightly swollen. There is a catarrhal inflammation, but the excessive product of inflammation has been promptly discharged through the yet pervious tube into the uterus, and this natural drain has saved peritoneal extension. Occasionally the ovary, too, will show signs of having from time to time been obliged to aid in resisting the mild infection. It is large and tender. But its powers of resisting infection is such that an abscess has never been allowed to form. It has felt the strain however, and hypertrophy and sensitiveness are the result. In just these cases then, which it is so hard to differentiate, electricity may be employed. The endometritis which almost invariably exists may be treated at the same time. By curing that, the caravan by which the infected baggage is dumped into the tube is destroyed. And then we have nothing to accomplish but to stimulate the appendages into reparative activity.

When the endometritis has been cured it is only necessary for us to pass a strong current of galvanism through the tender and sore appendages by placing suitable electrodes on either side of them in such a position as to render it necessary for the current by passing in the shortest and most direct route, to pass through their substance. This should be done too, by increasing the current from 0° to maximum with absolute gradations, and when the treatment is finished by reversing the process from maximum strength to 0° . This is accomplished by a current regulator or rheostat, and is for the purpose of avoiding without the possibility of failure the slightest risk or shock in the current. And this is necessary in order to avoid sudden muscular contractions of the abdominal or other pelvic muscles, and thus avoid the remote possibility of rupturing a pus sac, which because of human fallibility might have been overlooked in the careful examination.

A vaginal electrode placed well into the vault of the vagina on the side of most pain, or when the pain is of equal severity on both sides, on either side at alternate treatments, attached to the negative pole should be employed as the internal instrument. Opposite to it on the abdominal wall on the appropriate side should be a small clay electrode or my abdominal electrode attached to the positive pole. A current should be switched on by means of the regulator which at its maximum should not exceed 100 milliampères. It should be allowed to act for five minutes at its maximum strength. These treatments should be given every other day. Hot water douches and vaginal depletion and support by means of wool tamponades saturated with glycerine may be employed advantageously at the same time. The treatments are to be employed as long as improvement is progressive until a cure is accomplished. If

these cases are accompanied by endometritis the active electrode may be made the positive intrauterine form, and proceed as in the treatment of endometritis alone.

The effect sought in this treatment is almost entirely that obtained as a general stimulant. The inter-polar effect of the galvanic current acting as a powerful trophic stimulant, thereby enormously assisting the power of resistance of the diseased organs against infection, and at the same time stimulating their reparative process. This treatment sometimes fails. If it does fail, nothing is usually left but castration or misery. If it does succeed, as it frequently will to my certain knowledge, one more pair of appendages will thereby be preserved, and the blush of the next generation of surgeons for our shortcomings will be just so much less crimson.

NEUROSES.

Neuralgia or nerve pain, not caused by any actual recognizable local pathology of the nerves to which the pain is referred, which is a frequent accompaniment of menstruation, and which is located in the uterus, tubes or ovaries may be designated neuralgic dysmenorrhæa. These patients are usually of a neurotic predisposition. A nervous temperament is theirs, and they are frequently subjects of hysteria. They are frequently anæmic, pale, and quite often spare of flesh. Frequently they are overworked mentally, physically or both. A debilitated state from any cause predisposes to neuralgia. Prolonged lactation, overchildbearing, sexual excesses, uterine hæmorrhages, excessive exercise, loss of sleep and so on are predisposing. Malaria is a frequent cause of neuralgia. Superficial or spinal nerves, pure and simple, or deep mixed nerve branches or nerve trunks, are about equally the seat of neuralgia. Important superficial nerves, like the fifth, the cervico-occipital, cervico-brachial, dorso-intercostal, dorso-lumbar, and sciatic in proportion to their importance are affected by neuralgia. So too with the important nerve supply of the heart, stomach, kidneys, intestines, uterus, ovaries and tubes. These latter particularly interest us.

In the little strong box, called the true pelvis, are located these important organs. The Creator of all realized when he was providing for the propagation of all living creatures that the organs of reproduction must be well cared for. Therefore next to the brain the female organs of reproduction have the most protected position in the human skeleton. It is not enough that these organs should be protected by a bony pelvis; they also have one of the most wonderful net work of nerves surrounding them and connecting them with each other, and their several parts with the other important organs of the abdomen-the organs of digestion, which must, by automatic action, demand suitable nourishment and provide for its perfect assimilation for the benefit of the new life in utero-the organs of circulation which must on occasions of each new fecundation lay new and larger blood channels for the growing fœtus and keep them well pumped full of nourishing blood-the lungs which must be warned that respiration must be regulated for two or three lives instead of one, and so with the whole economy of woman must these organs be connected by wonderful nerve channels. And this is only one phase of the nervous mechanism of the organs of the pelvis. They have spinal nerves connecting them with the spinal

cord and brain-nerves through which the sexual instinct of the brain may regulate the organs of the pelvis; motor nerves which control their motion; peripheral sensory nerves which connect their motor apparatus with the mucous membrane and the skin of the external genital apparatus. And finally the wonderful mechanism which regulates pregnancy, which times the growth of the fœtus, which provides for its expulsion, which produces involution, which provides for lactation, and at last provides for the reëstablishment of ovulation. this is the nerve mechanism which may become the seat of nerve pain, which nerve pain may be superinduced by the periodic discharge from the uterus, and this nerve pain and menstruation together we call neuralgic dysmenorrhœa. Neuralgic dysmenorrhœa is characterized by pain of greater or less severity located in the ovaries, the uterus or the tubes without local pathology of any kind being manifest or discoverable. The pain is purely functional as far as we are able to discover. It is of almost every description dull, grinding, sharp, continuous, irregular and of every grade of severity. It is rather prone to irregularity and is frequently unilateral.

Treatment.—In treating neuralgia no permanent results can be expected, of course, without discovering and removing the cause. This is not always an easy matter. Electricity has become of late one of our most valuable adjuncts in the treatment of neuralgia. It is a question if it does not frequently possess more than temporary effects. In the employment of electricity for neuralgic dysmenorrhæa, we have two forms in which it may be employed. First, as the direct current for its local and general stimulating effect on the nervous system and for the ano-electro-tonic or sedative effect of the positive pole. Second, as the faradic current employed as a sedative with rapid interruption from the fine wire coil.

Method of Application.—The galvanic current should be employed during the intermenstrual period. Intrauterine, or intravaginal, or intrarectal electrodes should be employed as the negative pole (unless the seat of the pain is the uterus, when the intrauterine pole should be positive), and the opposite pole in the form of a clay pad should be placed so that the painful portion of the pelvis shall be in direct line of the circuit. A current of from fifty to seventy-five or one hundred milliampères should be employed from five to ten minutes every second day throughout the intermenstrual period. I have frequently witnessed cases where this simple treatment has been followed by absolute relief in one month. I have seen other cases where relief has been apparent in one month, but were only completely relieved after months of application; while I regret to say, I have seen a goodly percentage of cases which were not even relieved by the procedure. These latter should not be given up without first trying on them the fine wire faradism. The fine wire faradic current may be employed as a supplementary treatment to the galvanic, employing it at the same sitting following the other, or it may be employed independently or at each alternating treatment. It is best applied by means of a bipolar electrode, either uterine or vaginal, unless it is applied directly following or supplementary to the galvanic when to spare the patient the additional discomfort of changing the electrodes the poles may be directly attached to the instruments already in place. The faradic should be as strong as the patient will bear without undue discomfort. It should never be painful.

The fine wire faradic current is sometimes employed during the paroxysms of pain, during menstruation. I have never had experience with its use at such a time.

It may be applied by through and through surface applications, by placing two surface sponges or clay electrodes, one over the painful region on the abdomen, and the other opposite on the back.

Thus in the rational application of electricity may we appropriate a remedy which will make us master of a few conditions in gynecology, which otherwise must appear to us as insurmountable barriers outside of radical surgery. If I were obliged to choose between exclusive surgery and exclusive electricity, as a means of relief, cure and ultimate happiness to my gynecological patients, my conscience would compel me to choose electricity, but, gentlemen, I am thankful to say, we have at least one element of the general practitioner, we are acquainted with two great gynecological remedies instead of one, and if we can cure a woman wholly by electricity, we possess the necessary knowledge to do so. When electricity is not applicable or fails, then with a clear conscience we may resort to that other noble branch of our art.

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DEVELOPING MUSCLE BY ELECTRICITY.

An elaborate series of experiments with the view of determining the effects, beneficial or otherwise, of various forms of electricity on living muscular tissue have been carried on recently by Dr. Debedat, of Bordeaux, France. The account appears in full in the January number of the Rev. Int. d'Electrotherapie. The following are his conclusions:—The action of electricity on muscular nutrition is complex; in the form of continuous currents it acts differently than to excite contraction; so far as it excites contraction its action is comparable to that of ordinary exercise, over which it has important advantages from a therapeutic standpoint; moderate muscular exercise caused by rythmic faradic currents, representing natural exercise, produced very marked effects; excitation by rythmic galvanic currents in the form of shocks produced a favorable action, but the action is less than that produced by faradic currents; prolonged tetanization by faradic currents produced an over-working of the muscle followed by a wasting away of the tissue; a static spark produced no permanent modification.

ELECTROLYSIS—SOME PRACTICAL POINTS.

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THE REMOVAL OF SUPERFLUOUS HAIR.

Although the removal of superfluous hair by electrolysis is quite tedious and requires much time and patience, yet the operation, when properly performed, is decidedly successful and in applicants for treatment of this character, we have a very grateful class of patients.

Facial hirsuties has been ascribed to many causes—neuropathic tendency, deficient menstruation, sterility, etc., but, be the cause what it may, the life of many women is made miserable; they shrink from society and are driven to a life of seclusion by an unsightly growth of hair upon the face.

To remove hair by electrolysis it is necessary to have a galvanic battery of six or more cells, a needle and a holder, a pair of epilation forceps, a hand sponge electrode and a magnifying glass. If a portable battery is desired, one of the zinc-carbon-bichromate type is the best, but it is never economical to buy a six cell galvanic battery, for, although it is of sufficient strength to do this class of work, it is altogether probable we may need current for other operations requiring a greater number of cells, therefore a twelve or eighteen cell battery is always preferable.

Where we have a great amount of resistance to the passage of the current, as in electro-diagnosis, or where both electrodes have only skin contact, the silver chloride cell will do very well, but for subcutaneous work, such as the removal of hair or for gynæcological work, it is totally inadequate—"a delusion and a snare."



FIG. I.

The selection of a needle is an important item in this operation and the point should always be examined with a strong glass that we may be able to ascertain its shape. An ordinary jeweler's broach will do if the point be ground off on an oil stone and its temper drawn by heating, but the bulbous pointed needle, as recommended by the late Dr. P. S. Hayes, a magnified drawing of which is here shown in Fig. 1, is best suited for the work. There are several very important reasons why a sharp pointed needle should not be used; first, there is a depression in the epidermis at the base of every hair, very plainly shown in Fig. 2, the bulbous pointed needle will always find this depression while the sharp pointed needle is just as liable to miss it and not get into the hair follicle at all. Again, the hair follicles are not always the

same depth or the same direction, but the sheath surrounding the hair is tough, in fact, it takes considerable pressure to force the bulbous pointed needle through and it naturally will find the proper depth, while as Dr. Hayes remarks, "the sharp needle would, in many cases, penetrate the walls of the follicle and wander into the tissue far from the desired point, and failure rather than success would be recorded." Many hairs are removed with sharp pointed needles and many writers advocate their use, but success is



FIG. 2.

purely accidental. Fig. 2 shows a magnified hair shaft and follicle into which a sharp pointed needle has been plunged and has not entered the depression at the free surface of the skin but which has accidentally penetrated the sheath from without and gained access to the papilla. Of course such hair will be permanently destroyed. By referring again to Fig. 2, it will be noticed that the sheath is narrowest at the top, or at the point of insertion of the hair shaft into the epidermis, which shows the necessity of actually following the hair shaft with the needle in order to be certain of entering the follicle.

Again, the bulbous needle presents a larger surface within the hair follicles, the benefit of which is apparent.



The holder used by the writer is ten c. m. long and six m. m. in diameter, with hard rubber insulation extending within a short distance of the point; on the distal end is a screw collar which tightens the jaws holding the needle, while on the proximal end is the socket for holding the cord tip.

The holder should be without a "current breaker" as it is preferable to have the patient "open" and "close" the circuit as hereinafter described. The forceps should be light and strong, with the inner aspect of the points smooth and in exact apposition. The hand sponge should be slightly oval in shape, the longest diameter being almost equal to the length of an adult hand.

The magnifying glass is a superfluous accessory with many operators although we are strongly in favor of its use, as with it the results are much more certain. The principal objection to the ordinary magnifying glass, is that it deprives the operator of the use of one of his hands, but the glass used by the writer is mounted upon a head band, the arm having a double ball and socket joint which allows of its easy and quick adjustment. It can be used either on the head of the operator or patient and does not strain the eyes—the focal distance is about five inches, which allows ample working room between the glass and the seat of operation.

These accessories have been described at some length because most of the failures in this operation can be traced to poorly made electrodes. You cannot do good work without good tools. My instruments were all made by the McIntosh Battery Co., of Chicago, to whom we are indebted for the cuts here shown.

If a battery of the zinc-carbon-bichromate type be used, it requires about three or four cells if the battery has been recently charged. If it be one of the various forms of Laclanche batteries, it will require five or six cells; always remember, however, that the amount of work six cells of any style will do in five minutes, three of the same cells will do in ten minutes, or double the time. This is true in all electrolytic work. So, if the electro-sensibility of the patient is not great, we can use more cells and shorten the time.

The needle is attached to the cord from the zinc terminal or negative pole, and the hand sponge being well moistened with water, is attached to the positive cord and laid on the table in front of the patient. The needle is now inserted into the hair follicle and the patient told to complete the circuit, not by placing his hand flat upon the sponge, but by first merely touching it with the tips of the fingers and gradually straightening the hand until the contact is complete; in this way all shock is avoided. The hair is now grasped by the forceps, but little or no traction should be used. When the hair is loosened by electrolysis it will come out almost by itself.

Do not operate on a number of hairs in close proximity—a slight scar might result. Do not seize the hair with the forceps before introducing the



needle—it obliterates the depression by which the needle should enter the follicle.

From thirty to fifty hairs are usually removed at one sitting but, with patients of phlegmatic temperament, as many as seventy-five or one hundred may be removed without much discomfort; such séances, however, are very trying on the operator—it is hard work.

With a careful operator, and good electrodes, not over 3 or 4 per cent of hairs should return.

THE REMOVAL OF WARTS, MOLES, NÆVI, ETC.

Many persons who have not used the current for the removal of small growths, get the idea that it is a "burning process" similar to that of actual cautery, and we have frequently had requests from physicians to select for them a "cautery battery suitable for the removal of hair and small adventitious growths."

Electrolysis is simply the breaking up or separating of a substance into its primary elements by electricity, and, in case this substance should be the contents of a tumor or other growth, the "ions" or products of such breaking up or decomposition are taken up by the absorbents and the growth is gone. All electrolytic work of this character is accomplished with the negative pole for the active electrode, the positive being placed on some indifferent part; as success is largely dependent upon this fact, it becomes absolutely necessary to be certain which is the positive and which the negative pole, regardless of the fact that the binding posts on the battery may have been marked "P" and "N" by the manufacturer.

The easiest and most definite way to determine this is to wet a small strip of bibulous paper with a solution of potass. iodide (any strength) and place the two cord tips from an acting galvanic battery about one half inch apart on wet paper, when the positive pole will leave a deep brown stain of iodine, or if the potass. iodide is not at hand, use a strip of litmus paper and test in the usual manner for acids or alkalies, the positive pole being acid will turn blue litmus paper red, while the negative pole being alkaline, will turn red litmus paper blue.

Six galvanic cells of the zinc-carbon-bichromate type are sufficient for the removal of small growths, but a greater number may be used if the electrosensibility of the patient is below the normal, when of course the time of operation will be correspondingly shortened; while if the tolerance of the patient is poor, a less number of cells may be used and the sitting prolonged. The strength of current must always be considered with reference to time.

Our experience has been that a mild current for a longer time is productive of better results than a very strong current for a shorter time. If we are treating a nervous, sensitive patient, it is always best to produce a circumscribed anæsthesia at the seat of operation by the use of cocaine in connection with the current. This cataphoric action of the current will be explained in a future article, it being deemed sufficient for the present to say that a small piece of absorbent cotton is saturated with a solution of cocaine (about 10 per cent) and laid upon the spot to be anæsthetized, when a metal electrode (the cord tip will do) connected with the positive pole of the battery is pressed against the moist cotton for about five minutes. The strength of current for this work we



govern by the sensation of the patient and the location of the operation, (very little current can be used about the head). Use as much current as the patient can comfortably bear.

The scar which often results from using a needle subcutaneously is caused

by electrolytic action on the epidermis and can be avoided by insulating the needle at that point. Every practitioner who intends to do this class of work should have a small bottle of shellac varnish—ordinary orange shellac dissolved in alcohol—with a camel hair pencil inserted into the cork, similar to a bottle of mucilage. The needle to be insulated is pushed into a soft cork, about one-eighth of an inch, more or less, according to the size and growth to be treated, then painted with the varnish up to the free surface of the cork and allowed to dry. All needles should be thus treated especially when working about the face, where the resultant scar would be unsightly.

Very small growths require only one needle which should not be trocar pointed but flat at the distal end and always attached to the negative pole of a galvanic battery—the half curved needle is nearly always preferable. The needle is introduced at the base of the tumor on a line with the skin not clear through, but nearly so; the current is then gradually turned on and allowed to remain until the tumor is blanched to an ashy hue. The length of time required, varies from five to fifteen minutes, according to the number of cells used, and as our only guide is the blanched appearance of the growth, it can only be learned by experience.

In benign tumors, however, it is only necessary to establish a retrograde metamorphosis, therefore it often happens that with only small current and not much blanching the growth will disappear after a few days. One séance with one needle should be sufficient for a small growth, like a wart or mole, and the writer succeeds in removing much larger tumors at a single sitting by using more than one needle attached to the negative pole.

Needle holders constructed to hold several needles can be obtained from the instrument dealer, one of which is shown in Figure 1. With this electrode from one to three needles can be used from one pole.

Flexible strand needle holders of from one to six strands, one of which is shown in Figure 2, are also used for the same purpose, but where not more



FIG. 2.

than three needles are required most operators prefer the electrode shown in Figure 1, for this reason; caustic alkalies are liberated by the action of the negative pole and when these come in contact with animal tissue they cause a slippery condition, consequently unless the patient be in a recumbent position, the needles are constantly slipping out. This tendency of the needle to slip out can be remedied by the holder in Figure 1, because they are directly under the control of the operator.

Figure 3 shows the method of operating on a nævus with two needles attached to the negative pole.

These needles should be separated as far apart as the size of the tumor will permit, in order that the current may traverse all parts, and, although it lessens the resistance to have the positive sponge as near the seat of operation as possible, it cannot always be done, especially when working about the head, as, by so doing, the current would pass directly through the brain tissue in

traveling from one electrode to the other; therefore, it is preferable, in most operations upon the head, to have the patient hold the positive electrode in the hand.



In larger growths, as that shown in Figure 4, as many as six needles may be used from the negative pole, all converging toward the center.

It is not best, especially in large growths, to use the positive sponge "stabile" (in one place) but to move it from one point to another around the circumference of the growth, but always without breaking contact with the skin. Malignant growths should always be destroyed at one séance.

An interrupted galvanic current has been highly recommended for cancerous growths on the principle that the epithelial cells composing them are of very low vitality and are destroyed by an interrupted current with but very little electrolytic effect on the surrounding sound tissue; but, as the current must be large (often as high as 500 milliampéres), it becomes necessary to anæsthetize

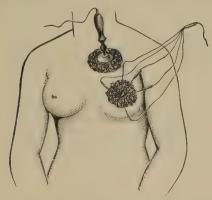


FIG. 4.

the patient, and the treatment is not popular. Dr. Nunn, of Savannah, Ga., has obtained good results in this class of cases with very little current. (See paper read at the last meeting of the American Electro-Therapeutic Association).

ELECTRICAL ENDOSMOSIS OR CATAPHORESIS.

Dear Sir: In the International System of Electro-therapeutics, page C-12, Dr. Frederick Peterson says that potassium iodide and tincture of iodine should be applied by means of the anode or positive pole, while in the same work, page N-8, Dr. Walling says exactly the reverse. I know many physicians who would like to be set right on this matter, and therefore ask you (through the columns of the Clinic or otherwise) to state such physical facts as may be necessary for that purpose.

E. T.

Omaha, Neb., March 2, 1895.

Electric endosmosis and exosmosis are not new operations, but have long been known and in therapeutics properly come under the head of electrolysis.

In the nomenclature given us by Faraday, those ions or products of decomposition which appear at the anode or positive pole he called "anions," and those which appear at the cathode or negative pole, "cations."

The anions are electro-negative, and are repelled by the negative pole because they are the same potential as that pole. The cations are electro-positive, and being repelled by the positive pole, whose potential is the same, they are drawn to the negative pole in accordance with the well-known law that "unlike poles attract each other."

Iodine, bromine, chlorine, oxygen, etc., are anions or electro-negative elements and have a strong affinity for the *positive* pole; therefore, when treating, for instance, an enlarged thyroid gland with solution of potass, iodide, we must use the solution on the *negative* pole if we wish to utilize the resolvent effects of the iodine.

Nearly all of the metals, so far as we know, are "cations" and appear at the negative pole; if, then, we put a solution of potass, iodide on the positive pole and complete the circuit through some conducting medium, the potassium hydrate being a metal and a cation, will be transferred through the medium to the negative pole, while the iodine being an anion will remain at the positive pole, for which it has an affinity, and we will merely have the same effect as from a local application of iodine. Reference was made to this fact in a physical way in a preceding article; in commenting upon the best way of testing the polarity of a battery, the writer said, "Wet a small strip of bibulous paper with a solution of potass, iodide (any strength) and place the two cord tips from an acting galvanic battery about one-half inch apart on the wet paper, when the positive pole will leave a deep brown stain of iodine."

All the bases are electro-positive or cations, and if we were using a solution of morphia sulph. or cocaine hydrochlor, we would apply from the positive pole, when the base, which in this instance we wish to utilize, will be transferred through the tissues to the negative pole, for which it has an affinity. When using a solution of potass, iodide it is not the purpose of the operation to convey the potassium or base through the underlying tissue, but the iodine.

Some beneficial results may be obtained from the use of iodine on the positive pole by what might be called "secondary reaction," which may be explained by the old experiment of the glass rod and pith ball; the rod having a positive charge by excitation will pick up the pith ball because it is of opposite polarity or different potential, but after awhile, or when the disturbed

equilibrium is restored and the ball becomes the same potential as the glass rod, it is repelled.

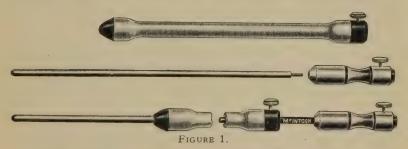
The same phenomena takes place when we use the iodine on the positive pole; the iodine being of different electric potential than the positive pole is first drawn to it, but afterward by secondary reaction or when the difference of potential is restored, it is repelled and does penetrate the tissues to a certain depth. Possibly this is the secret of the good results claimed by some operators when using iodine from the positive pole.

Considerable ingenuity is necessary at times on the part of the practitioner in making these applications, as for instance, in using a solution of potass, iodide for making an application of iodine to the endometrium, we would take a small applicator or sound wound with absorbent cotton, dip into a solution of potass, iod, and when in situ attach to the positive pole and the iodine will be set free just where you want it, although the application will be purely local unless the séance is prolonged to the point where secondary reaction is established.

METALLIC ELECTROLYSIS.

Experiment.—Connect a copper wire to each pole of an acting galvanic battery and immerse them in a solution of common salt; a circle of green will be seen to form about the wire attached to the positive pole, which gradually grows larger until it has diffused itself throughout the liquid; if, after a few moments, we remove the copper electrodes from the solution, it will be noticed that the one connected with the positive pole of the battery is corroded, while that attached to the negative pole is unaffected.

Explanation.—The chlorine being electro-negative goes to the opposite or positive pole, where it combines with the copper, forming the chloride of cop-



per, which in turn unites with the oxygen set free at the positive pole by the decomposition of the water, forming the oxychloride of copper. The latter, becoming feebly electro-positive by secondary reaction, is repelled by that pole and thus is diffused throughout the liquid.

There is nothing new about this electro-chemical action; it has long been known but, as it has attracted considerable attention lately from a therapeutic standpoint, we make the foregoing explanation for those who have not had an opportunity of studying these phenomena.

The fluids of the body all contain sodium chloride, one of the factors necessary to obtain any of the oxychlorides of the baser metals, and when applying the positive galvanic current to any part of the body where the electrode is of soluble metal such as copper, zinc, iron, etc., we make an application of the oxychloride of such metal at the point where the electrode comes in contact with the body, which is carried still deeper into the tissues by cataphoric action.

The deposition of this metallic salt is much more marked when the electrode is used subcutaneously or on a mucous surface, because of the greater supply of sodium chloride; but where application is made to the skin, it becomes necessary to moisten the part with salt water or dip the electrode in the same solution.

This application of the current has a wide range in medicine, and many conditions not considered amenable to electric treatment by ordinary methods, come within its scope. The oxychloride of copper is a powerful antiseptic, having eight times the microbicidal power of the current itself and is indicated in all pathological conditions dependent upon germ origin.

In old cases of gleet or in granular conditions of the prostate, its action is not excelled by any other remedy; the technique is as follows: After excluding stricture, select a copper sound that will easily pass the meatus and when introduced (generally to the full depth of the uretha), attach to the positive pole of a galvanic battery, the negative being placed at some indifferent point, and gradually turn on the current until a strength of fifteen milliamperes is reached; after this has been maintained for about five minutes, the operator will discover that the electrode has adhered to the mucous lining of the canal. Without disturbing the electrodes the current is now turned off gradually, and the polarity reversed either by means of the pole changer on the battery or an interchange of the cord tips at the binding posts; the current is now turned on again until a strength of about seven or eight milliampéres is obtained, when in a few moments, the current may again be turned off and the electrode easily removed.

Caution—Be sure that the current is turned off before attempting to reverse its direction, as otherwise the patient will receive an unpleasant shock.

The writer has seen two cases of chronic gleet where a worn-out condition of the mucous lining of the urethra was entirely restored and the discharge stopped by two seances as above, but we cannot always expect such brilliant results.

The electrodes for this class of work shown in Fig. 1, are ten inches in in length, of various diameters and 97 per cent pure copper. The one designed for intrauterine applications is provided with a rubber muff for the purpose of insulating the electrode up to the point of the external os to protect the vaginal walls from the action of the current.

The electrode shown in Fig. 2 is designed to be used in the prostatic urethra, having an active surface of two and four square centimeters, the hard rubber insulation being vulcanized on the stem, thus preventing septic matter getting between the insulation and the metal; the distal end is also insulated by a hard rubber olive shown in cut. Copper needles for cystic growths are easily made of copper wire.

In ordinary applications of electricity to mucous surfaces, the polar effect is such as to sometimes cause excessive cauterization of the part, which often leaves undesirable cicitricial tissue, a hard, unyielding cicatrix like an acid burn if the positive pole has been used, or a soft pliable one if the negative has been the active pole, either of which is liable to bring its quota of suffering to the unhappy patient, but when using the oxidizable metal for the positive electrode, as copper, zinc, or iron, the polar effect of the current is expended upon the metal, consequently we can have no cauterization of the tissues, and of course no cicatrix. This is a very important point.

In dermatology, this method of applying the current is making rapid strides, especially where dependent upon the existence of parasites or bacteria—two extensive patches of lupus are reported to have entirely disappeared under its use, as also several cases of psoriatic lesion.

To summarize, then, metallic electrolysis has the following advantages. Small currents being used, the pain is apt to be slight. The applications be-



ing generally made to mucous or abraded surfaces, cocaine anæsthesia is easily effected, if desirable. No cauterization of the tissues, therefore no cicatrix. It is applicable to conditions not considered amenable to the ordinary application of electricity, such as cystic growths, etc. No cases of poisoning from the salts of copper or zinc have been reported, probably for the reason that so little of the metal is dissolved.

In using iron for the active electrode we get all the tonic and styptic effects of that metal directly applied. The application of zinc, on account of its escharotic properties is almost wholly limited to the stump after excision of malignant growths, or recurrent cancer.

In general, the advantages of metallic electrolysis over other methods of applying the current are well marked in indolent ulcers, wounds, hæmorrhoids, tuberculous abcesses, hydrocele, cysts, etc.; while in gynæcology, its use is limited to inflammatory conditions and suppuration.

We realize that the factors of metallic electrolysis embodied in this paper have been merely touched upon, but hoping that many inquiries may result, which will be cheerfully answered, the writer reluctantly leaves the subject in its incompleteness.

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Physicians should remember that all prices in this catalogue, excepting those marked "net," are subject to a liberal discount.

On the closing pages of this catalogue will be found a list of the principal dealers who handle our goods. Our batteries and electrodes can be purchased from these houses at the same discount which we offer to physicians.

DESCRIPTION OF THE McINTOSH COMBINED GALVANIC AND FARADIC BATTERY.

This Battery is constructed on an improved plan. The zinc and carbon plates are arranged in couples and securely clamped to hard-rubber plates with thumb-screws. Thus any of the couples can be removed by simply loosening a screw. The thumb-screws are also used for binding posts. By this manner of connecting the plates are brought nearer together than in any other Battery, thus giving less internal resistance. The cells are made in sections of six and a drip-cup, composed of one solid piece of hard rubber. By this arrangement one section can be handled, emptied and cleaned as easily and quickly as one cell. It also prevents the liquid from running between the cells, as is the case when single cells are used, and danger of breaking, as is the case with glass cells. The drip-cup on the side of each section of cells is to receive the zinc and carbon plates when removed from the cells. We manufacture these cells in our factory and carefully test them with acid the same strength as Battery fluid. By this test we know that every cell is perfect before it leaves the shop.

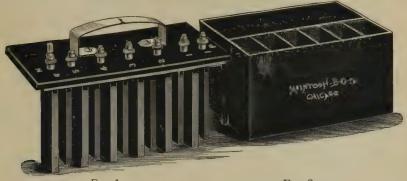
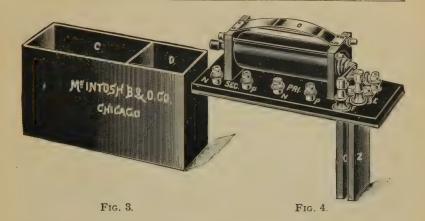


Fig. 1. Fig. 2.

Fig. 1 shows the hard-rubber plate of a section (on the under-surface of which is cemented a sheet of soft vulcanized rubber) and binding posts which project through the hard and soft rubber and screw into the brass piece holding the zinc and carbon couples. The rubber plate on which the couples are clamped projects over on one side enough to cover the cells when the zinc and carbon plates are placed in the drip-cups. When the cells are not in use, and the lid of the Battery box is closed, it presses on the spring handle of the section (Fig. 1) and holds the soft rubber firmly over the cells and drip-cup. By this arrangement the hydrostat is made water-tight.

Fig. 2 shows a section of six cells and a drip-cup, made of one piece of hard vulcanized rubber. The drip-cup is to receive the zinc and carbon couples when not in use.

By the aid of a simple current selector any number of cells can be used. See cut.



AN EXTRA CELL OF LARGE SIZE IS ADDED to the, Combined Battery for the purpose of running the Faradic Coil (Fig 3). This renders the Battery more perfect than any yet offered to the profession. This extra cell gives sufficient power for the Faradic current, and the operator is not obliged to connect and exhaust the current from the galvanic cells. If greater strength is ever needed in an emergency than the extra cell gives, the galvanic cells can be connected with the coil (see directions). The Faradic Coil (Fig. 4) is securely fastened on a plate of polished hard rubber, which serves for a cover to the large cell and drip-cup and to hold the elements. Soft rubber is cemented on the under side of this plate, which is securely clamped over the cell and drip-cup, when the lid of the battery box is closed by means of pressure on the spring fastened on the coil. Each Battery is furnished with a hard-rubber Electrode box, which is placed in the cover of the battery box. This Combined Battery gives greater quantity and intensity than any ever offered to the profession. It weighs less, occupies less space and is perfectly portable.

A Battery of twelve cells gives a galvanic current of sufficient intensity for a majority of cases the physician may be called upon to treat. With eighteen or twenty-four cells a physician has at his command all the strength and

intensity he will ever require.

Faradic Coils.—Much wisdom is offered both by writers and by some manufacturers on the subject of Faradic coils with "long fine wire secondary." much of the current literature on this, as well as on kindred electrical subjects, is very misleading, because the deductions are not based upon sound physics, and as physicians generally have many other things to do than to post themselves properly upon these subjects, they are naturally dependent upon this very literature for their information, and consequently are not to be blamed for their confusion of ideas caused by diverse statements.

Briefly, when a current of electricity passes through the primary coil, the soft iron core becomes magnetized and the magetic "lines of force" or "flux lines" permeate the primary as well as the secondary coil. Convolutions of wire in the coils cut these lines of force at right angles, because they (the

lines) travel from north to the south pole of the magnet.

Now, the more times we cut these lines of force with the wire or the greater the number of turns we give to the wire, the more voltage or pressure

we have in the current delivered.

We use in the secondary coil fine wire, only because we can cut these magnetic lines of force many more times within the same distance with fine wire than we could with coarse wire. In other words, a secondary coil wound with coarse wire would give us just the same voltage as one wound with fine wire,

provided the number of turns was just the same, but for the convenience of occupying smaller space we use fine wire in the secondary coil. The point which we wish to make plain is that after a sufficient number of turns of fine wire has been put into the secondary coil to furnish higher voltage or pressure than the patient is able to stand, there can be no gain in therapeutic effect from a greater length of wire. In some of the coils advertised (if they contain it)? the long wire is of such length and fineness that the strongest person would not be able to stand one-half the amount generated by such a coil. The improvement in the faradic coils of the future will lay not so much in the length of the wire in the secondary coil as in the character of the interruptions because as we increase the number of the interruptions we approach that quality of current which produces anæsthesia. Slow interruptions produce muscular contractions and improve muscular cell growth, while a higher rate of interruptions produces a numbing of the sensory nerves and produces the effect we call anæsthesia.

The Faradic Coils of our Batteries are wound with special reference to the proportion of wire used, so as to give a pleasant though powerful current, which is free from the sharp, stinging sensation experienced in so many batteries having coils made to give a current of great intensity without regard to

quantity.

The Faradic Battery weighs less than 8 pounds; the twelve-cell combined Galvanic and Faradic Battery less than 15 pounds, and the eighteen and twenty-four cell combined only 20 and 24 pounds each, and is perfectly portable, so it can be carried in the hand or a buggy with but little danger of dam-

age by slopping or spilling of the fluid.

We furnish each battery with or without a Faradic coil. When combined with a Faradic coil a physician has at his command, in one case, two first-class batteries—a Galvanic, giving sufficient quantity and intensity for treating any disease, electrolysis, etc., and a Faradic, giving an induced current of sufficient strength and intensity to treat any disease where it is indicated.

These batteries are so simple in construction that any person reading the

directions will have no trouble to operate them.

Great care is taken in the manufacture, as none but skilled machinists and electricians are employed to do the work, and only first-class material is used

All the metal work is finely nickel-plated and polished. Every part of the battery is so perfectly made that, in case any part is broken, a duplicate can be furnished and put in place without any trouble. It is our determination to sustain our well-earned reputation as producers of the very highest quality of workmanship.

We call particular attention to our cable conducting cord. This is composed of three strands of copper wire enclosed in tinsel and closely woven into an insulated cable. The tips are securely fastened to a bundle of wires by means of a new device which make the connection perfect. This feature alone recommends our battery to the profession.



To repair a cord unscrew the tube B from the tip C, draw the cord through, cut away the broken end, slip back the covering, knot the wires and screw the tube into the tip. This clamps the wires in the tip as seen in A, and makes a perfect connection.

We can furnish large portable batteries up to thirty, thirty-six or forty-two cells. When so many cells are desired, we advise the party to order two batteries—two eighteen-cell or an eighteen and twenty-four cell, as they would be more convenient to handle, and, if a case should ever require the use of so many cells, both batteries could be connected and used as one. A Faradic coil could be furnished with one of the batteries.

Parties can purchase the above number of cells in separate cases as cheap as in one large case.

The testimony of physicians who have used thirty-two and thirty-six cell batteries can be summed up by giving in few words the experience of one of

high standing and long experience,

"A battery of thirty-two cells is almost useless as a visiting battery, for
it cannot be carried even a few blocks without great fatigue, and I would forego electric treatment rather than carry it even that distance. I seldom require a battery of more than twelve to eighteen cells. This size is the most convenient for a visiting battery."

VALUABLE BOOKS.

We often have inquiries from physicians for some practical treatise on Electricity. "Elementary Principles of Electro-Therapeutics, for the use of Students and Physicians. Prepared by C. M. Haynes, M. D." Price in cloth, tinted paper, \$2. This is a book of 502 pages with 151 illustrations, especially adapted to the wants of students and those physicians who have recently begun the study of medical electricity. It treats briefly of the principles of Magnetism, Franklinism, Faradism, and Galvanism; fully describes and illustrates the manner of applying them, and thoroughly sets forth the importance of the intelligent use of electricity, according to one of three recognized methods. namely:

- 1. Conveying electricity directly to the organ, nerve or muscle to be acted upon.
- 2. Influencing an organ or muscle through the nerve which supplies tt.
- 3. Applying electricity to a distant part in such a way as to excite the reflex action of the nerves, and thus indirectly affect the part to be treated.

The location of electrodes to produce these several results is so clearly described and illustrated that it is possible for those having very slight knowledge of anatomy to find the motor points, the ganglia, or correct position of the various organs, and apply electricity effectively instead of in the haphazard way commonly practiced, which is quite as likely to do harm as good, and which has done not a little to bring this valuable remedial agent into disrepute.

For a more exhaustive treatise, we recommend the valuable work by Beard & Rockwell, "Medical and Surgical Electricity." This is a standard work of 788 pages, with nearly 200 illustrations. It gives the principles of electro-physics, the physiological action of electricity and its application.

The authors, who have had a long and successful experience with electricity as a remedial agent, give a large number of cases treated by them.

We will forward this work, eighth edition, prepaid. on receipt of publisher's price. Cloth, \$5.50; or leather, \$6.50.

We take pleasure in announcing the early issue of a most valuable book on Electro-Therapeutics by Prof. Hood. The objections raised by many physicians to works on electricity that they are too technical, too scientific, too exhaustive, too theoretical and not practical, is entirely overcome in this work. The book will comprise about 250 pages and contain some 200 illustrations. Price about two dollars.

See also the list of valuable books mentioned on third page of cover.

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It is made on the same principle as our higher-priced Faradic Batteries, and is portable. It is not intended to take the place of the Physician's Battery, but for domestic use.

It is put up in a neat, black-walnut case, $6\frac{1}{2}$ inches long, 6 inches high and 5 inches wide, with patent clasp fastening and handle and furnished with electrodes and conducting cords; all the metal work is finely nickel-plated.

No one can contradict us when we say that no portable battery of the same quality is or has been sold at the low price we offer this one.

We now furnish with this battery the No. 1 Handles and Sponge Discs.

A pamphlet containing full instructions for charging and using the McIntosh Family Faradic Battery is furnished with each Battery.



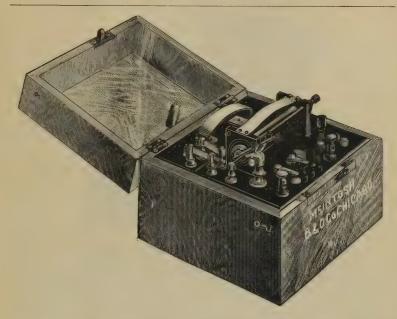
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This battery is put up in a neat, polished black-walnut case, six inches in width, nine inches in length and seven inches in height, and weighs less than six pounds charged. All the metal work is nickel-plated.

It has a hard-rubber cell and drip cup. First-class induction coil, with polished, hard-rubber ends and cover. The coil, binding-posts and rheotome are placed on the upper surface of a polished, hard-rubber plate, the under surface of which is covered with soft rubber, and also holds the zinc and carbon. When the elements are removed from the cells and placed in the drip cup, this plate is securely clamped over them and makes them water-tight. The connections of the coil with the zinc and carbon are permanent.

To use this battery, raise the elements from the drip-cup and place in the cell, and the battery will commence to work at once; connect one end of the conducting cords with the binding-post and the others with the sponge electrodes, and it is ready to use.

It is very convenient for a physician's visiting battery or family use, as it is light and perfectly portable and gives sufficient strength to treat any case where the Faradic or induced current is needed.



MCINTOSH PHYSICIAN'S FARADIC BATTERY, NO. 3.

This instrument is intended for a physician's visiting battery. It is put up in a finely polished black walnut case, eight inches long, eight inches wide, and six and one-half inches high. All the metal work is finely nickel-plated.

It has several new features, one of which is the Mier-dirk rheotome in place of the ordinary spring vibrator. This interrupter is automatic in character and is one of the very best yet devised; as with it the interruptions can be made to vary from 50 or 60 up to many thousands per minute; enabling the operator to improve muscular cell growth by slow contractions, or produce local anæsthesia by very rapid vibrations, thus giving the full range of faradism.

The fine wire secondary affords the widest range of intensity.

The coil, rheotome, binding posts, pole changer, indicator, and switch to connect primary or secondary current with the binding posts, are attached to a polished hard rubber plate 5x7 inches, with space for electrodes underneath.

The selection of the *primary or secondary* current is controlled by means of a switch. The elements are securely clamped to a hard rubber plate, the under side of which is covered with a thick sheet of pure soft rubber; a handle on this plate serves the purpose of a spring, which gives firm and even pressure over the cell and drip cup when the case is closed.

When the battery is to be used, open the box, raise and reverse the plate holding the elements, which immerse in the cell and connect the coil by means of the two bars, which should be pressed into the slots in the two posts oppo-

site them This makes a very simple, perfect connection.

Another new and very important improvement in this battery is the perfect connections of the elements. The ends of the zinc and carbon plates which are fastened to the rubber plate are covered with hard rubber, which is put on in a soft state, then vulcanized.

This is the only connection ever made with zinc and carbon elements, where the metal work and screws are perfectly protected from the battery fluid.

Price, with Sponge Electrodes and our Cable Conducting Cord, \$24.00.



SIX-CELL GALVANIC BATTERY.

In a polished black walnut case, 7 inches long, $8\frac{1}{4}$ inches wide, $7\frac{1}{4}$ inches high, metal work all nickel-plated, sponge electrodes, conducting cords and hard rubber electrode box. This is very convenient for such light electrolytic work as the removal of hair, etc., but is too small for general practice.



SIX-CELL COMBINED GALVANIC AND FARADIC BATTERY.

Same style of case and finish as the above, 9¾ inches long, 8¼ inches wide, 7¼ inches high with first-class Faradic coil, extra large cell to run the coil, electrodes, conducing cords and hard rubber electrode box. This battery gives a galvanic current same as above described, and a Faradic current of sufficient strength to treat any case.



TWELVE-CELL GALVANIC BATTERY.

In a polished black-walnut case, 10½ inches long, 8¼ inches wide, 7¼ inches high, metal work all nickel-plated, lock and handle sponge electrodes, cable conducting cords and hard-rubber electrode box. This is a very convenient visiting Battery, as it weighs only eleven pounds, and gives a galvanic current of sufficient intensity to treat any case where a mild current is indicated.



TWELVE-CELL COMBINED GALVANIC AND FARADIC BATTERY.

Same style of case and finish as the above, 13½ inches long, 8¼ inches wide, 7¼ inches high, with first-class Faradic Coil, polished hard-rubber ends and cover, extra large cell to run the coil, electrodes, our new cable conducting cords and hard-rubber electrode box. This Battery gives a galvanic current same as above described, and a Faradic current of sufficient strength to treat any case.

Price......\$36 00.



EIGHTEEN-CELL GALVANIC BATTERY.

In a polished black walnut case, 14¼ inches long, 8¼ inches wide, 7¼ inches high, with lock and handle, metal work all nickel plated, first-class sponge electrodes, cable and conducting cords, and hard rubber electrode box. It gives a powerful current and weighs but a little over 15 pounds.

Price......\$36 00



EIGHTEEN-CELL COMBINED GALVANIC AND FARADIC BATTERY.

Same style of case and finish as the above, 17 inches long, 8¼ inches wide, 7¼ inches high, with first-class Faradic Coil. This is the most convenient battery for a physician's use, as it gives a powerful galvanic current and a Faradic current of sufficient strength to treat any case, and is portable.



TWENTY-FOUR CELL GALVANIC BATTERY.



TWENTY-FOUR CELL COMBINED GALVANIC AND FARADIC BATTERY.

· DIRECTIONS ·

FOR OPERATING THE

MCINTOSH COMBINED

Galuanie and Faradie Batteries

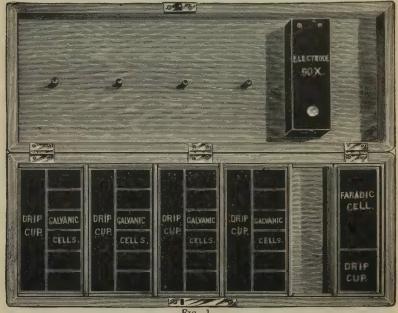
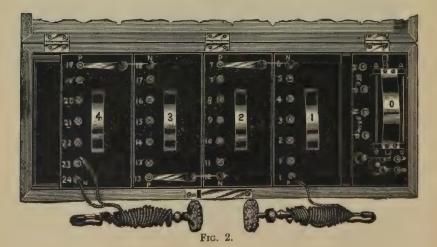


Fig. 1.



Before attempting to charge and use a Battery, please read these directions carefully and notice, by the aid of this diagram and your battery, just how to make the fluid, fill the cells, connect and work, as parties after purchasing a battery sometimes write us asking questions which these directions would answer. We do not make this request to save ourselves trouble, for we are always pleased to answer any questions in regard to our batteries, but to save time and much perplexity to the owner.

To make the Battery fluid: R—Sulphuric acid (commercial), 3 fluid oz.; Powd. Bichromate of potass., 2 oz.; Water, 16 fluid oz.; Bisulphate of mercury, 2 drachms. Dissolve the Bisulphate of mercury in the water; then add the Bichromate of potass. When dissolved, pour in the sulphuric acid and allow the liquid to cool, as the mingling of the acid and water produces heat, and if the mixture is used when warm it injures the battery.

The bisulphate of mercury keeps the zincs well amalgamated.

To fill the Galvanic Cells, remove the sections with the aid of the spring handles marked 1, 2, 3, 4; fill each cell a little more than half full (or to fill equally use the small glass measure accompanying the battery).

Fig. 1 shows the combined Galvanic and Faradic Cells in correct position. After filling or cleaning the cells they should always be placed as shown in this cut.

Fig. 2 shows the Galvanic sections of 24 cells connected for use. Each section is marked respectively on the spring handles 1, 2, 3, 4.

To use six Galvanic Cells, lift Section 1 and remove the elements from the drip-cup; carry forward and place them in the galvanic cells; then connect one conducting cord with P 1 and the other with N 6 (all parts marked P are positive and N negative).

To use 12 cells, lift Section 2 from the drip-cup, move it forward near Section 1, and place the elements in the galvanic cells; connect N 6 with P 7 by means of the horizontal bar and the conducting cords, one with P 1 and the other with N 12.

To connect 18 cells, lift Section 3 from the drip-cup, carry forward and place the elements in the galvanic cells, then connect N-12 with P-13, and the conducting cords, one with P-1, the other with N-18.

To connect 24 cells, lift Section 4 from the drip-cup and place the elements in the galvanic cells, then connect N—18 with P—19 by means of the horizontal bar and the conducting cords, one with P—1, the other with N—24.

To use a less number of cells, remove the cord from N-24, and place it in a post opposite the number to be used.

From O to Section 2 shows a 12-cell Combined Battery.

From O to Section 3 shows an 18-cell Combined Battery.

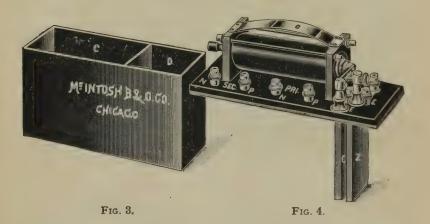
From O to Section 4 shows a 24-cell Combined Battery.

How to Detect the Galvanic Current.—Put one sponge, well wet, in the palm of the hand, and let the other be held between the thumb and the first

finger of the same hand. A slight pricking sensation will be experienced. Those only accustomed to the induced or faradic current will be disappointed to find the galvanic current causes only a slight pricking or burning sensation, or perhaps a slight dizziness when applied to the head. A galvanic current that car scarcely be felt in the hand may be too strong to apply to the head or neck.

The bifurcated or forked cord is for the purpose of preventing a shock while changing to a less or greater number of cells while using the galvanic current. For example: Suppose you are using seven cells. One of the bifurcated ends would be connected with cell No. 7, and the other end hanging loose. If you wish to use, say twelve cells, take up the loose end of the bifurcated cord and connect it with No. 12 and pull the other end out from No. 7. Thus all shock is avoided in the change.

To use the Faradic section of the Battery holding the coil, lift the section marked O from the cell and drip-cup, fill the large cell half full of battery fluid, reverse the section and place the elements in the large cell C and the



Battery will commence to work at once, which may be known by the buzzing of the rheotome. To obtain the primary current, insert the tips of the conducting cord in posts P and N, on either side of "prim." To obtain the secondary current, insert the cord tips in posts N and P on either side of "Sec." Either current can be made stronger by drawing out the shield in the coil.

To connect the coil with one or more galvanic cells: In a case of emergency, like an attempt to resuscitate a person from drowning, where greater intensity is needed than one cell will give, the coil can be connected with the galvanic cells of Section 1 by means of the long, spiral wires, as follows: Reverse the coil section, immerse the elements of Section 1 and connect post A near the coil with post P 1 on Section 1, and post B on coil with post 2, 3, 4 5 or six, on Section 1.



MCINTOSH ELECTRIC CHAIR.

Price, as shown in Cut, \$80.00

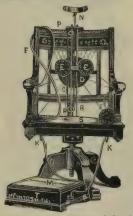
Electric chairs offer to the Electro-Therapeutist one of the most satisfac-

tory means of applying electricity in office practice.

Our chair is complete in all its arrangements, and presents a very attractive appearance, the chair being made of walnut, handsomely finished, and the electrodes and attachments of metal, heavily nickel-plated. Any make of battery can be used, and by means of the switch-board on the back, the current can be passed through any part of the body desired, or in any direction, the buttons in the switch connecting with the electrodes for neck, back, seat, right and left hand, right and left foot, and two extra binding posts on arms of chair so any special electrode can be attached that the operator desires to use. The chair can be raised or lowered, to accommodate the height of the patient. By means of a small wheel, the back electrode, as shown in small cut, can be raised or lowered and can be turned as shown by dotted lines, to confine the

application of the current to the spine. The space between the discs on the electrode can be diminished at will, or either one can be removed. The neck electrode can be adjusted to the height of the patient by means of a set screw. The foot stool can be inverted, and as the inside is lined with metal, it can be filled, if desired, with water, or a dampened sponge or cloth placed in it. The flexible insulated electrode attached to arm of chair as shown in cut can be removed, and the other one substituted, and any electrode required can be attached in place of the sponge-covered disc.

DIRECTIONS FOR CONNECTING THE McINTOSH ELECTRIC CHAIR WITH BATTERY, SHOWING MANNER OF ATTACHING ELECTRODES AND OPERATING THE CHAIR.





Back of Chair.

The circular switch-board in the center of back of chair is made of polished rubber, and all the metallic attachments to the chair are nickel-plated.

Any form of battery may be used.

The two binding posts on the lower part of the switch-board are connected with the cells or battery, which furnish the current. The polarity of the buttons depends upon the method of connecting the battery; if the positive pole be joined to the binding post on the right, the semi-circle of buttons on the right will be positive; if the negative be joined to this binding post, the buttons on the right will be negative. In either case the buttons on the left will have opposite polarity.

R. Two rods extending the length of the chair-back, upon which moves

a sliding bar.

E.E. Sponge-covered electrodes fastened upon a metal crosspiece upon which they may be moved near together or apart. The crosspiece is fastened to the sliding bar by a pivot, about which it revolves so that the electrodes may be horizontal, as shown in cut, perpendicular, or at any angle; one electrode may be removed and the other turned in any position required.

P.P. Pulleys which carry a chain C.

C. The chain which raises or lowers the sliding bar on the rods R.

D. The switch-board on the back of the chair.

N. Neck electrode adjusted on a metal rod by means of a thumbscrew. It may be turned in any direction, raised, lowered, or removed altogether.

F. F. Flexible insulated metallic conductors attached to the arms of the chair. They terminate in sponge-covered electrodes in the illustration, but any style of electrode may be attached. These conductors are of sufficient length to reach any part of the patient sitting in the chair. They may be removed entirely.

A A. Binding posts to which the conductors are fastened.

H H. Metallic plates fastened on the end of the chair-arms, upon which the patient's hands rest when a current is to be sent through them.

S. Metal plate, or seat electrode.

K K. Binding posts to which are fastened the cords connecting the footstool T with the chair.

B.B. Binding posts on the footstool T.

M. Metal foot plates attached to T. D K. Switches or current directors. They also serve as pole changers, Off, the buttons upon which the switches are turned to open the circuit,

N, neck; B, back; A, arm; H, hand; S, seat; F, foot, L and R, prefixed, respectively indicate the left and right side.

The direction of the current passing through the patient will depend upon

the position of the switches.

The row of binding posts across the top are lettered to correspond with the buttons on the switchboard. They are only used when the chair is employed in a cabinet. Connecting wires from a switchboard outside the cabinet are joined to this row of binding posts on the chair, so that the operator can, from the outside, apply the current accurately to the different parts of the patient inside the cabinet.

C. The thumbscrew which fastens the rod carrying the neck electrode at

any height.

D. Wheel which turns the chain that moves Electrodes E E. It prevents the chain from rolling over the pulleys except when necessary.

The wires which extend from the switch-board to the sides of the chair-back form the connections through which electricity is conveyed to the electrodes.

The therapeutical effect of a current carried to a patient through an apparatus of this kind produces no other effect than that direct from the cells or battery which furnish the current, except that which may be produced through the imagination; but the convenience with which the electrodes may be manipulated and the current directed, together with the ornamental character of the apparatus, commend it to many practitioners.

Price, Complete, Without Battery......\$80 00

THE ACTION OF THE TURKISH BATH IN DISEASE.

READ IN THE SECTION OF MEDICINE AND PHYSIOLOGY, AT THE FORTY-SECOND
ANNUAL MEETING OF THE AMERICAN MEDICAL ASSOCIATION, HELD
AT WASHINGTON, D. C., May, 1891.

BY CHAS. H. SHEPARD, M. D.,

OF BROOKLYN, N. Y.

(EXTRACT.)

"The Turkish bath is simply a convenient manner of applying heat to the body, and is readily adapted to any diseased condition. It is not exhausting, as many suppose, nor is its salutary influence measured by its power to produce abundant sweating. One of the most remarkable properties of the bath is its ability to allay the sense of fatigue." There is an invigoration arising from the contact of the vitalized skin with the dry heat of the bath, which gives an increased power of drinking in Oxygen, through the channels previously closed, and withal there is little sensible loss of matter, what is parted with being only that for which the system has no further need. One of the uses of ordinary perspiration, is to maintain the equilibrium of temperature, on which the safety of the individual depends.

Men engaged in various branches of manufacturing industry, such as ore smelting, iron foundries, rolling mills and glass works, are habitually exposed for lengthened periods, to heat ranging from 200° to 350° , which they are able to sustain for years without any loss of vigor, or detriment to health. And this simply on account of the seven million little glands spread over the inner surface of the skin, which by evaporation, send off the heat that would otherwise raise the temperature of the body. So far indeed from high temperature proving injurious, it is the adaptability of the skin to resist high artificial heat upon which the Turkish bath relies for its marvelous sanitary and curative powers.

Thus we see that there is no foundation for the popular prejudice about the hot air bath increasing the temperature to a dangerous degree. Such a prejudice is not only condemned by physiology and experience, but it is in direct antagonism to the very laws of our being.

For the many troubles incident to childhood, the Turkish bath is a panacea. With me it has superseded all other treatment, and for carrying children through all eruptive fevers of that period, it has proven equal to every emergency. In the long list of diseases none seem more susceptible of relief by the hot air treatment than gout, rheumatism and neuralgia. The action of the Turkish bath in rheumatism has been phenomenal, and commands the respect and admiration of all who have investigated the subject.

Dr. Erasmus Wilson says, "Scrofula is imperfect nutrition, cancer is imperfect nutrition, indigestion, rheumatism, gout, neuralgia, are imperfect nutrition. Give a power by which nutrition can be regulated and you immediately control these various diseases. Now there is no power by which the proper direction of nutrition can be attained, excepting through the skin, and that I believe to be the explanation of the extraordinary results which seem to flow from the bath. The bath does no more than regulate nutrition.

In our own country, such physicians as Dr. W. A. Hammond, Dr. Austin Flint, Sr., Dr. Lewis A. Sayre, Dr. John T. Metcalf, Dr. W. H. Van Buren, Dr. George T. Elliott, Jr., Dr. F. N. Otis, and many others have borne strong testimony to the great value of the Turkish bath in disease.

Certainly a beginning in the use of the Turkish bath as a remedial agent, has been made. It has passed the exerimental stage, and in the not distant future, medical science will necessarily be compelled to adjust itself in harmony with the facts so readily at hand, and so easy of demonstration."



McINTOSH COMBINED ELECTRO-THERMAL BATH CABINET.

THE MOST ECONOMICAL AND SATISFACTORY MEANS OF ADMINISTERING TURKISH BATH TREATMENT.

The Thermal Bath Cabinet is designed for the application of hot air or vapor with any form of electrization. By its use the physician can avail himself, at a trifling expense, of all the remedial advantages to be obtained in the most expensive Turkish or vapor bath establishments.

This apparatus is simple, neat and convenient, occupies little space and can be used in an office where it is not possible to furnish the conveniences

for the water bath. It is not necessary that a dressing room be provided, and only a small amount of water is required.

The increasing popularity of this apparatus, and the very rapidly growing demand for the McIntosh Combined Electro-Thermal Bath Cabinet has led us to make many valuable, though costly, improvements and additions, among which we may mention: lining the cabinet throughout with zinc, thus overcoming all the annoyance in former cabinets of shrinkage of the wood, caused by sudden and frequent changes from high temperature with dry heat to vapor bath or shower bath. This improvement also adds to the ease with which the cabinet can be kept perfectly clean. We have placed a sliding electrode back of the seat, which serves the double purpose of a rest for the back of the patient upon the stool and also permits of the treatment of any portion of the back or spine by means of the sliding electrode, which is so arranged that it can have a fresh covering of sponge or linen for each treatment.

We furnish with each cabinet four Ammonium Chloride Cells which in connection with an elegant Faradic Coil Switch Board, furnishes the cabinet with a complete Faradic Battery.

We feel a commendable degree of pride in asserting that the McIntosh Combined Electro-Thermal Bath Cabinet as we now offer it to the profession is the most elegant, as it is beyond comparison the most complete in its appointments, and the cheapest Thermal Bath Cabinet in the world.

Dry heat is supplied by passing hot air from a gasoline or gas stove through a 3-inch copper pipe connected with funnel tube (as shown in cut). In the vapor bath, both the heat and vapor are supplied from a small copper boiler which is placed over the gasoline or gas stove and connected by means of a flexible hose with the bath cabinet. By placing the heating apparatus outside the cabinet, all danger to the patient is avoided.

We always send gasoline stove unless special request is made for a gas stove.

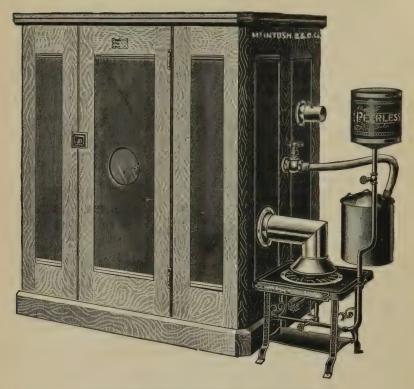
For full instructions as to method of using, see accompaning illustrations and directions.

POTE. We furnish four Ammonium Chloride Cells to operate the Faradic Coil of this cabinet, but if parties ordering the Cabinet prefer to have a more powerful cell we will if requested send a Partz Acid Gravity Battery No. 1 instead of the Sal Ammoniac Cells.

NOTE. We are prepared to furnish with this cabinet, instead of the gasoline or gas stove, an electric heater, by which, if the practitioner has access in his operating rooms to the commercial current, he can connect this current with the electric heater and thus dispense with any other source of heat

Physicians should remember that all prices in this catalogue, excepting those marked "net," are subject to a liberal discount.

McIntosh Combined Electro-Thermal Bath Cabinet.



PRICE COMPLETE INCLUDING BATTERY \$200.00.

DIRECTIONS FOR SETTING UP AND OPERATING THE ELECTRO-THERMAL BATH CABINET.

To use the Bath with dry or moist heat, in connection with an electric current: On opening the cover of the cabinet the folding and sliding cover, E E, is brought to view and the double electric switch in space S. From the buttons of the switch board the connections are as follows.

"OFF" cuts out the current; N connects with neck Electrodes; B connects with sliding back Electrode X; R connects with the flexible cord and sponge Electrode on the right, for applying to any part of the body; L connects with the flexible cord and sponge electrode on the left, for applying to any part of the body; S connects with the seat E by means of binding post H; F connects with zinc lining of the bottom, or feet Z.

TO CONNECT BATTERY WITH SWITCH BOARD.

Having connected your cells in circuit according to "Directions for setting up and charging Batteries" (see index), connect the carbon of the first cell of your battery with Switch lever No. 1 and the Zinc of last cell with Switch lever No. 2.

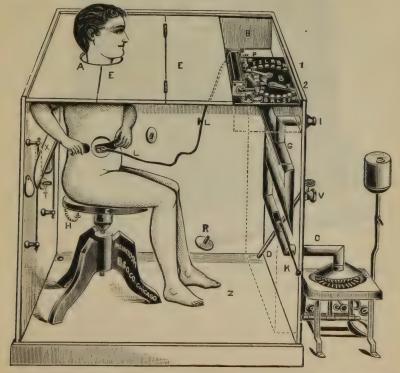
TO OPERATE THE SWITCH BOARD.

With the battery properly connected as soon as the battery switch is placed on button "On" the battery is brought into action and the familiar buzzing sound of the Faradic Rheotome is heard.

To carry the current from the neck to the feet, place switch 1 on N and switch 2 on F.

To carry current from neck to seat, place switch 1 on N and switch 2 on button S.

To carry a current from one hand to the other, place switch 1 on R and let patient take the sponge on left side in left hand, and switch 2 on L, and let patient take sponge at the right side in right hand. With these sponge Electrodes a current can be applied to any part of the body. To change polarity reverse the poles of the battery. To use dry heat, light gasoline stove, place outside of the cabinet under funnel tube C, open damper in escape pipe I.



close cabinet and observe thermometer T. To quickly raise the temperature, draw out damper K and allow the heat from the stove to pass directly into the

cabinet. When heated sufficiently close damper K and let the patient enter cabinet; regulate the heat at the gasoline stove and with the damper I. Fo use moist heat fill the small copper boiler about one-fourth full of water, place on gasoline stove and connect with valve V by means of flexible hose; see that small safety valve on boiler is loose enough to permit steam to escape easily. Open valve V wide; this allows the steam when generated to enter the cabinet freely at D. Watch the thermometer and do not raise the heat with steam over 100 to 105. The steam heat can be regulated by opening or closing the gasoline burner.



MCINTOSH COMBINED GALVANIC AND FARADIC BATH APPARATUS, NO. 1.

This Combined Bath Apparatus is very complete in its arrangement. The Faradic coil is nearly twelve inches long and three and one-half inches in diameter (with polished hard-rubber ends and cover), placed on the shelf of a polished hard-rubber bracket. The vibrator, magnet and binding posts are placed on the shelf in front of the coil. Twelve switches are placed on the perpendic-

alar plate of the bracket in circular form. Each switch has a positive and negative connection with its electrode in the bath tub. By this arrangement they can be used as pole changers. Within this circle is a patented galvanic double switch with buttons to connect with any number of galvanic cells. The switch in the upper left hand corner "H" connects either current with the binding posts—the one in the right hand corner, "T," connects either current with the tub switches.

This apparatus can be placed on a table or the wall in convenient proximity to the bath tub, and is the most convenient arrangement ever designed. It is very ornamental. The coil, with polished hard rubber ends and cover, produces a fine contrast with the nickel-plated metal of the vibrator, binding posts and switches. The primary and secondary wires in the coil are proportioned in length and size, so as to produce a quantity current very powerful in its character. It penetrates the innermost tissues of the body, and is free from the sharp, stinging character to be met with in many kinds of bath apparatus having coils of great intensity without regard to quantity. The position of the vibrator and binding posts in front of the coil and switches just above it, are very convenient to the hand of the operator. The shield is nickel-plated and graduated. The current increases in strength as it is withdrawn from the coil, and, by its intelligent use, any strength of current can be obtained, from one scarcely perceptible, to one so powerful that the strongest person can with difficulty endure it.

The switches are arranged in circular form. The one at the top marked H, connects with the head electrode in the tub. The one marked F, with the foot electrode. Those on the right side, with the electrodes in the tub on the right side. Those on the left with the electrodes in the tub on the left side as follows: C, chest; S, shoulders; B, bowels; H, Hips, and K, knees.

By means of these switches, the current can be directed through the patient in any direction, and its polarity changed at will in an instant. The dry current can be taken from the binding posts by means of conducting cords and handles, and applied the same as from an ordinary Combined battery.

This apparatus is furnished with any desired number of galvanic cells, the current from which can be directed through the bath electrodes or binding posts.

We furnish with each complete bath apparatus, in addition to the bath plate, one Partz Motor Cell to operate the Faradic Coil; one Wood bath tub. We can furnish bath tubs of soapstone or indurated fibre if desired, at additional cost to purchaser. Galvanic cells are not included in outfit, except by special order and at additional cost.

Price, complete as above described, without Galvanic Cells...\$200 00

If the Indurated Fibre Tub is desired, add \$20.00 net to price named above for information regarding Cells, see description and prices of same under head of "Chloride of Ammonium Batteries."



MCINTOSH COMBINED GALVANIC AND FARADIC BATH APPARATUS No. 2.

This apparatus is made on the same plan as our No. 1, but less expensive. The coil is inclosed in a triangular, polished black-walnut case, the front of which is made of polished black rubber. The switches, binding posts, rheotome, etc., are all nickel-plated and neatly arranged on the sloping front. It is arranged to connect with any number of galvanic cells. The coil is run with a special cell, and has the same bath tub and electrodes as No. 1.

Price without Galvanic Cells	140	00
Price of Plate only		

If Soapstone Tub is desired, add \$30.00 net to above prices.

If Indurated Fibre Tub is desired, add \$20.00 net to prices named above.

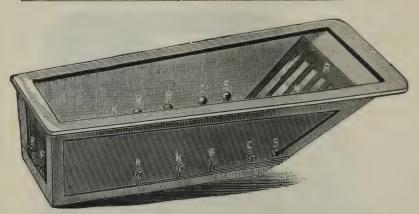
**For information regarding Cells, see description and prices of same under head of "Chloride of Ammonium Batteries."



MCINTOSH COMBINED GALVANIC AND FARADIC BATH APPARATUS, "EXTRA."

This magnificent piece of work was designed by us to meet the wants of two of the largest Sanitariums in this country, and we believe it to be the most complete outfit of the kind ever put upon the market. It is intended to meet the demands of large bath establishments, and will, at the same time, supply one or two physicians with the galvanic and Faradic current. On the perpendicular plate is arranged essentially the same accessories as the No. 1 apparatus; while the horizontal base, besides having the same accessories as No. 1, has in addition a small Faradic coil, an automatic rheotome for interrupting the galvanic current, milliampere meter and coil rheostat for from 100 to 15,000 ohms resistance, etc.

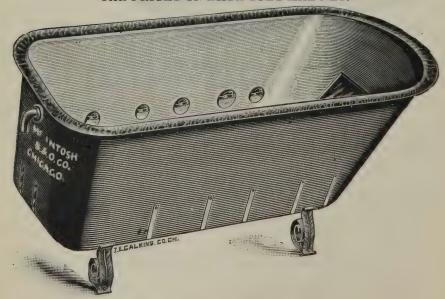
Pri	ce complete,	including	Indurated	Fibre Bath	Tub, with	
	special large	e cell for o	perating th	e bath coils	and 60 gal-	
	vanic cells.				\$450	00
Pri	ce of Plate of	nly			300	00



ELECTRIC BATH TUB (WOOD) WITH STATIONARY ELECTRODES.

The tub is usually made six feet four inches long, four feet six inches on the bottom, sixteen inches wide at the foot and twenty-one inches at the head, with a slight taper toward the bottom. The tub electrodes are highly finished and nickel-plated.

THE PRICES ON BATH TUBS ARE NET.



INDURATED FIBRE BATH TUB.



PARTZ MOTOR BATTERY No. 6.

This large and powerful cell is the one we now supply with the McIntosh Combined Bath Apparatus, to operate the Faradic Coil. A solution of Sulpho-Chromic Salt is best for charging this battery.

Partz Motor Battery, completenet,	\$4	50
Partz Motor Battery Zinc, only		60
Partz Motor Battery, Glass Jar, only "	1	25
Porous Cup, only		40
Carbon, each, only		40
Sulpho-Chromic Salt, 2-pound jar "		75
Wood Cover for Porous Cup		12
Brass Rings for Carbons		75
Thumb Screw for Brass Ring		20
Screws for Carbons "		06

THESE PRICES ARE NET.

The Electro-Motive force of one cell of the Partz Motor Battery is 2 volts, its strength of current 10 Amperes.

This cell is most admirably adapted to operating the Faradic Coil of The McIntosh Combined Galvanic and Faradic Bath Apparatus; it is also well adapted for use with The McIntosh Electro-Thermal Bath Cabinet, and is the most satisfactory s^lngle cell to use with The Tripier Induction Apparatus.

We believe a battery of three Partz Motor Cells is the very best and cheapest form of battery for operating small motors for light service, such as sewing machines in domestic use, etc.

PARTZ MOTOR BATTERY, No. 6.

Jar 7 in.x7 in.x7% in. High.

Patented January 24, 1882; May 10, 1887.

A POWERFUL BUNSEN BATTERY WITH THE FOLLOWING ADVANTAGES:
COMPACT FORM, LARGE CARBON SURFACE, FREE CIRCULATION
OF LIQUID, LARGE ZINC SURFACE, CLOSE TO CARBONS,
GOOD JOINTS, AND SUPERIOR WORKMANSHIP.

E. M. F., 1.95 to 2 volts; current on short circuit, 10 to 12 amperes; internal resistance, 0.25 to 0.30 ohm; capacity about 80 ampere hours.

The Partz Motor Battery, No. 6, is a strong, compact Bunsen battery, with five Partz patent slotted carbons attached to a ring surrounding the porous cup, within which the zinc is suspended. The space outside of the porous cup is filled with a saturated solution of Sulpho-Chromic Salt in water, the porous cup being filled with a strong solution of common salt.

Charge.—In each glass cell dissolve 1½ pounds of Sulpho-Chromic Salt in 4½ pints of moderately warm water, stirring until all the salt is taken up.

In each porous cup place 3 ounces of Chloride of Sodium (table salt), dissolved in 1 pint of warm water. (Note,—The porous cup can be recharged two or three times before the Sulpho-Chromic solution has to be renewed.)

Price.....net, \$4 50

FULL DIRECTIONS FOR SETTING UP ACCOMPANY EACH CELL.

At a discharge rate of 2.5 to 3 amperes, this battery will supply current for twenty-five to thirty hours, with moderate polarization. At this rate, the potential at binding posts will be about 1.25 volts, making the power delivered in external circuit about 3.4 watts per cell. It will take about 30 cells to deliver ½ electric horse-power and each charging of the cells would deliver ½ electric horse-power for about 30 hours. It will be seen from this that any attempt to obtain power from electric batteries is too costly, except in special cases where economy is no object.

Four to six Partz motor cells will furnish current which by means of a $\frac{1}{2}$ or $\frac{1}{2}$ horse-power motor of good construction will run a sewing machine or small fan for twenty to twenty-five hours. In a private family this time of actual use of a sewing machine would probably extend over from two to six veeks. The cells would therefore have to be refilled every two to six weeks, according to use. In commercial establishments, where the machines are run ten hours a day, the use of a battery to obtain the necessary power is not to be recommended.

To determine the number of cells required to give sufficient power to do any specified work, the volts and strength of current required in amperes must be known. Most motors are marked with the volts and amperes they require, but these figures represent the condition of full load; if the motor is doing less work, it will take less current. The actual volts and amperes required for the work may be much less, and can only be determined by measurement when the motor is performing the work.

THE PROPER SELECTION AND USE OF THE PARTZ BATTERIES.

Electric batteries are employed either-

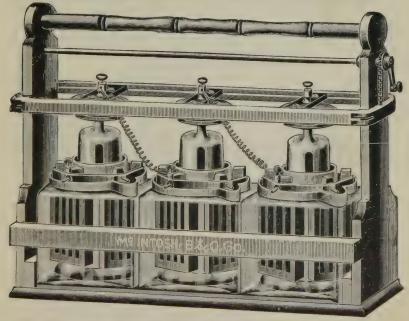
- To produce a current for the generation of power to perform mechanical work, such as the running of sewing machines, lathes, printing presses, etc.; or
 - 2. To operate signals, telegraph, telephones, ring bells, etc.

Batteries used to obtain power to run heavy machinery must supply powerful currents continuously. This requires so large an expenditure for zinc and chemicals that the cost of running soon exceeds the first cost of the batteries and with the trouble and expense of frequent renewals renders their use commercially unprofitable where any other power supply is available.

As we frequently receive requests for information on this subject, we give in our description of the Partz Motor Battery, No. 6, a statement of the number of cells required for obtaining different amounts of power, and the probable length of time they will run with one charge of solution.

The cost of the battery for such work as ringing bells, working signals, telegraphing, telephoning, etc., and for experiments, is a very small item compared with the value of the work done, especially when the form best suited to the work is selected, as no battery is equally good for all kinds of service. Some are best adapted to closed-circuit work, and others for open-circuit.

The Partz battery is preëminently a high-volt, strong, open-circuit battery, giving a nearly constant current until the exciting fluid it exhausted; or it can be used intermittently with long periods of rest intervening, the zinc and chemicals suffering no appreciable waste by local action while the circuit is open.



PARTZ MOTOR BATTERY. 3 CELL FORM.

Price, as shown in above cut, including Rheostat for Motornet	, \$25	00
Price of Four-Cell Battery, including Rheostat for Motor	30	00
Price of Sulpho-Chromic Salt, per Jar		75

PARTZ ACID GRAVITY BATTERY, No. 1, SQUARE CELL, WITHOUT POROUS CUP.

Patented August 17, 1886.

FOR SMALL ELECTRIC MOTORS, ELECTRO-PLATING, LABORATORY WORK,
THE CLASS-ROOM, ETC., AND ELECTRIC DENTAL MALLETS.



No. 1. Size of Jar, 7½ in. long, 7½ in. high, 5½ in. deep.

E. M. F., 19 to 2 volts on open circuit

Current on short circuit: With sulphate of magnesia solution, 3 amperes; with common salt solution, 5 amperes.

The Partz Acid Gravity Battery, No. 1, has an E. M. F., when freshly charged, of about 1.9 to 2.0 volts, and an internal resistance of about 0.8 ohm, when charged with sulphate of magnesia solution, and 0.4 ohm with a common salt solution. The glass funnel, when filled with 2 oz. (about 4 good teaspoonfuls) of Sulpho-Chromic Salt, will give about five ampere hours. When the voltage falls from exhaustion of the

supply, 2 oz. of the salt can again be added, giving about five ampere hours more. The funnel can be filled in this manner about twelve times, giving a total capacity of about sixty ampere hours, when the accumulation of the speut products will prevent further solution of the salt.

The cell should then be emptied, the carbon washed in warm water, and, if time will permit, dried in the sunlight; the zinc should be amalgamated if necessary, and the battery recharged, when it will be as good as new. The zinc should last about eight rechargings of the jar.

Charge.—For each cell, dissolve 11 ounces Sulphate of Magnesia in $2\frac{1}{2}$ pints of lukewarm water Fill glass tube to a little above the level of the solution with Sulpho-Chromic Salt.

•			
Price, per cellr	iet,	\$3	50
Square Glass Jar for No. 1 Battery	4.8	1	25
Wood Cover for No. 1 Battery	8.8		35
Zinc, Oblong, for No. 1 Battery	4.6		80
Carbon Plate for No. 1 Battery	£s	1	00
Carbon Rod for No. 1 Battery	4.4		15
Glass Tube for No. 1 Battery	6.6		15
Rubber Rings.	6.6		03
Metal Plate for Connecting Zinc of No. 1 Battery	8.6		25
Brass Milled Thumb Screw, No. 1 Battery	6.6		10
Brass Jam Nut. No. 1 Battery	4.4		05

Our Partz Sulpho-Chromic Sait is unequaled for making electropoion fluid for any Bunsen, Grenet or Zinc-Carbon Battery, no matter whose make.

PARTZ SULPHO-CHROMIC SALT.

Patented March 6, 1888.

Sulpho-Chromic Salt is, as its name indicates, a combination of sulphuric and chromic acids in an amorpho-crystalline state, the efficacy of which is

attested by the superiority of the batteries based upon its use.

It was especially devised for use with the Partz Acid Gravity Batteries. Its high specific gravity causes it to sink to the bottom of the jar, where it remains, forming a dense depolarizing solution, which, unless disturbed, will not rise, and therefore does not attack the zinc, so that the battery remains for long periods on open circuit without loss of efficiency.

Sulpho-Chromic Salt, when dissolved in water, makes a standard electropoion fluid without the necessity of handling liquid acids, having practically the same amount of stored energy as an equal quantity of fluid made in the ordinary ways, giving with a zinc-carbon element an E. M. F. of 19 to 2 volts,

and an ampere hour capacity of about the same.

We specially call the attention of battery users to this substance as affording the best, cleanest and most convenient method of making electropoion fluid for medical batteries, Grenet cells, Bunsen batteries, for lecture tables, experimental work, etc., and motor batteries.

Sulpho-Chromic Salt is put up in air-tight jars with screw lid, each jar containing two pounds. As the salt is hygroscopic, it must be guarded against

moisture.

Price per jar, 2 lbs,.....net, \$0.75

This salt can be used in place of bisulphate of mercury in pocket medical batteries, nearly doubling the current. Be sure that the zincs are well amalgamated.

All users of electropoion fluid would find it advantageous to send for a

sample jar, and thoroughly test its merits in making battery fluid.

The formula for electropoion fluid is-

1 Jar (2 lbs.) sulpho-chromic salt.

6 pts. water.

Add to this 1 oz. bisulphate of mercury, when the fluid is to be used in Grenet, medical or other batteries, without porous cup.



88. DR. MCINTOSH'S CARBON DISC ELECTRODE.

This Electrode is designed to take the place of the old style Sponge Electrode. The carbon disc (which takes the place of the sponge) is soldered to a metal disc, and both are covered with soft rubber (except the outer surface of the carbon), which is then vulcanized or hardened. By this process the rubber is made to adhere so firmly to the edge of the carbon disc that they become virtually one piece. This prevents fluids from entering between the carbon and rubber.

Between the rubber handle and rubber-covered carbon is a hard rubber disc, to hold a cloth cover or sponge when the handle is screwed against the disc. This arrangement is similar to the Universal Sponge Holder. It is very convenient, as cloth covers can be used over the carbons and changed with each treatment, thus insuring perfect cleanliness.

IMPROVED HUSSEY PATENT BLUE STONE BATTERY.

No MERCURY USED.

No Amalgamation of the Zinc Necessary.

Works
Instantaneously
with Pure Water
Only.



WITHOUT BEING SHORT
CIRCUITED AND
WITHOUT THE USE OF
SULPHURIC ACID
OR SULPHATE OF ZINC.

To Charge this Battery, 4 Lbs. Blue Stone to each Jar.

THIS IMPROVEMENT CAN
BE APPLIED TO ALL
6x8 BLUE STONE JARS
AT PRESENT IN USE.

Cell complete	25
Glass Jar "	30
Porous Cup	40
Copper'	20
Zinc	35

DIRECTIONS FOR CHARGING AND MAINTAINING THE IMPROVED HUSSEY BLUE STONE BATTERY.

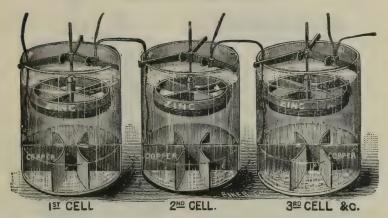
- 1st. Open out copper in shape of star, bend the lower corners of it, so that the blue stone will hold it firmly at the bottom of the jar.
 - 2d. Put in blue stone up to about one-half inch of top of copper.
- 3d. Pour pure water into glass jar until copper is covered about one-half inch deep.
- 4th. Pour pure water into porous cup—enough to make it set steady and upright in jar—and place cup in jar, put the zinc in porous cup and fill with pure water until within two inches of top of porous cup. Fill the glass jar with pure water until within one and one-half inches of the top. "Use no acia in either porous cup or jar."

The Battery is now ready for Telegraph, Telephone, Fire Alarm, Train Signaling, Medical or Open Circuit work. It will charge storage batteries at the rate of eight-tenths to one-ampere per hour.

To maintain it, all that is necessary is once every week to draw off from the bottom of the porous cup with a battery syringe, one-half of the contents of the porous cup and refill with pure water to within two inches of the top.

This improvement can be applied to all forms of blue stone jars at present in use.

GRAVITY BATTERY.



This form of Battery is well adapted for a stationary office battery; (though neither so cleanly nor so economical as the Chloride of Ammonium Cells).

When once charged and connected, it will run for months, without the necessity of removing and cleaning the elements. The only attention it requires is to supply water, as it evaporates, and occasionally a little sulphate of copper. It can be connected with any of our switch-boards, which can be attached to a table, electric chair, electric bath, vapor bath, or any apparatus that would be practicable to connect with a galvanic battery.

This battery is so simple that any one, with the aid of the full directions we furnish, can charge and connect the cells, etc., without any trouble.

The Gravity (or Primary) Battery is an essential accompaniment of the Storage (or Secondary) Battery, in localities where the electric light current is not available.

A battery of eight 6x8 gravity cells is sufficient to charge the small storage battery. Twelve 6x8 cells are sufficient to charge the Medium Storage Battery. Twenty 6x8 cells should be used to charge the Large Storage Battery.

GRAVITY BATTERY.	Main. 5x7 inch. No. 1.	Main or Local. 6x8 inch. No. 2.	Local. 7x8 inch.
Cell completenet	\$ 65	90	\$1 10
Zincnet	25	40	45
Coppernet	15	15	15
Tripod Hanger net	15	15	15
Jar, Glassnet	25	35	40



This cell is constructed upon the same principle as all of the "La Clanche" or Chloride of Ammonium cells. The carbon element and cover of the Battery constitute one solid piece of carbon, with connections on top so that there is but little chance of corrosion. The zinc passes through the carbon top and is insulated by a porcelain thimble. The carbon cover fits tightly so that there is almost no evaporation. The upper portion of the carbon element and the cover is boiled in paraffine, so that there is no climbing up of the salts by capillary action. This cell has been thoroughly tested and has given the following results: Connected with a Faradic Coil with Milliampere-meter in Circuit, it ran the Coil 300 hours, giving a 70 Milliampere current. On short Circuit gives one ampere, Its voltage will average 1.5.

Battery Complete\$0	en
	00
Carbon Element only	20
Zinc only	45
	08
oar Ammoniac, per package	08

We do not manufacture these cells, and therefore we do not guarantee them.

PRECAUTION.

When renewal of "Sal Ammoniac" is required, clean the jar; scrape off the glaze which may have accumulated on the surface of the carbon, and soak the carbons in warm water for several hours, allowing the carbons and top or cover to dry before setting up the battery. When the fresh charge of Sal Ammoniac is placed in the jar, be careful to get none on the edge or top of jar. Do not spatter or slop the solution, for if it touches the cover or sides of the jar, the salt will dry on the glass and by capillary attraction, draw more salt out of the jar. When the zinc is renewed, the solution also should always be renewed.

Use the battery carefully and keep it clean and it will be always ready to respond to your demand for service.

DIAMOND CARBON BATTERY.

The fluid of the cell is a solution of muriate of ammonia; the elements are zinc and carbon rods, arranged as shown in cut. The cell is so nearly



perfectly sealed, that evaporation is measurably prevented, a feature that in itself highly recommends any cell for use in physicians' office cabinet. The cell has the following advantages:

- 1. Cleanliness.
- 2. High electro-motive force—1.50 volts.
 - 3. Small internal resistance.
 - 4. Great power of recuperation.
- 5. It is a cell that will run for medical purposes many months, requiring very little attention or expense.

All work accomplished by any galvanic battery, in the treatment of fibroid tumors of the uterus by the powerful current recommended by Apostoli, can be accomplished with a battery of 50 Diamond Carbon Cells properly attached to a selective switch-board or a gradual rheostat. The cells of the above

battery will also operate the induction coil of a Faradic machine.

Battery, complete	\$1 00
Jar only	20
Metal Top only	50
Carbon Sticks only	05
Zincs	08
Sal Ammoniac, per package	06

We do not manufacture these cells, and therefore we do not guarantee them.

PRECAUTION.

When renewal of "Sal Ammoniac" is required, clean the jar; scrape off the glaze which may have accumulated on the surface of the carbon, and soak the carbons in warm water for several hours, allowing the carbons and top or cover to dry before setting up the battery. When the fresh charge of Sal Ammoniac is placed in the jar, be careful to get none on the edge or top of jar. Do not spatter or slop the solution, for if it touches the cover or sides of the jar, the salt will dry on the glass and by capillary attraction, draw more salt out of the jar. When the zinc is renewed, the solution also should always be renewed.

Use the battery carefully and keep it clean and it will be always ready to respond to your demand for service.

NOTICE.—In ordering always designate the Batteries or Parts desired by the Names Below.

THE PERFECTION IN POROUS CUP BATTERIES.

In the AXO Battery the defects which have been so long recognized, and have come to be regarded as inherent, in Porous Cup Batteries, are met and overcome The improvement in form of construction alone is so great as to recommend it at once to all who are familiar with batteries.



"AXO" BATTERY COMPLETE.



"AXO" POROUS CUP

"AXO" BATTERY.

Cell Complete		 				 	 								. \$1	00
Porous Cup alone																
Glass Jar																
Zinc																
Sal Ammoniac, per package	9 .	 	D ==			 	 									06

"GONDA POROUS CUP" BATTERY.



Cell Complete\$0	75
Porous Cup alone	65
Class Jar	20
Zinc	10
Sal Am. in bag	06



"GONDA POROUS CUP" BATTERY COMPLETE.

"GONDA POROUS CUP"

We do not manufacture these cells, and therefore we do not guarantee them. See Precaution.



THE IMPROVED DOUBLE CYLINDER LAW SATTERY.

In the construction of the Cell the cover is so made that by a slight turn it locks down tightly against a soft rubber ring, effectually sealing the jar against evaporation of the water and crawling out of the salt.

We do not manufacture these cells, and therefore we do not guarantee them.

THE MANUFACTURERS OF THE LAW BATTERY claim the following points of excellence:

Electromotive force, 1.5 volts.

2½ pints of solution against 1 pint found in a porous cup.

147 square inches of negative surface.

Freedom from evaporation, creeping salts and corrosion.

High efficiency combined with great durability.

Use the battery carefully and keep it clean and it will always be ready to respond to your demand for service.

Law Battery complete\$1	32
Double Cylinder	75
Jar	
Cover, with Rubber Ring	
Carbon Screw Connector.	
Zinc Binding Post	
Sal Ammoniac	

THE SAMSON BATTERY.





Samson Battery No. 1.

Carbon Vase and Cylindrical Zinc.

The No. 1 Samson Cell has an electromotive force of 1.44 volts. Internal resistence of 0.14 ohm. It is 6 inches high and 3½ inches square.

We do not manufacture these cells, and therefore we do not guarantee them.

No. 1 Samson Battery complete	1.00
No. 1 Carbon Vase only	.65
No. 1 Cylindrical Zinc only	
No. 1 Glass Jar only	.16
No. 1 Rubber Cover only	.09
No. 1 Rubber Fender only	.08
No. 1 Rubber Ring only	.06
Sal Ammoniac, per package	.06

The No. 2 Large Samson Cell has an electromotive force of 1.47 volts. Internal resistance of 0.11 ohm. It is adapted for all open-circuit work where a large out-put is suddenly required; answers admirably for Telephone work, Gas-lighting or operation of Rhumkorff coils. Size, $6\frac{1}{2}$ inches high by 4 inches square.

No. 2 Samson Battery complete	.15
No. 2 Carbon vase only	.80
No. 2 Cylindrical Zinc only	.20
No. 2 Glass Jar only	.18
No. 2 Rubber Cover only	.10
No. 2 Rubber Fender only	.09
No. 2 Rubber Ring only	.07
Sal Ammoniac, per package	.06

Chloride of Ammonium Batteries.

In the early days of electro-therapy the portable battery filled every desire of the electro-therapeutist, for the reason that electrical treatment if called for, was required to be administered at the home of the patient. At the present time the office practice is one of the most important, as it is in many cases the most valuable perquisite of the physician.

It is the rapid growth in value and importance of office practice which has called into being the large variety of elegant and costly Office Batteries, some of which are illustrated in this catalogue.

The typical galvanic cell is the Zinc Carbon Cell with Bichromate fluid, and the McIntosh Zinc Carbon Bichromate Cell as used in our Portable Batteries has no superior. In the construction of the McIntosh Office Batteries, in which under variously modified designs of switch-boards and table or wall plates, from 25 to 60 cells are connected in circuit and operated by the Patent Double Selector levers of the switch-board, we use the various forms of Chloride of Ammonium Batteries, as illustrated in this catalogue. These cells, although not so high voltage (the average being about 1.5) as the Zinc Carbon Bichromate Cell are given preference in office batteries, owing to their valuable features.

PERFECT CLEANLINESS, SMALL INTERNAL RESISTANCE, GREAT POWER OF RECUPERATION, DURABILITY, CHEAPNESS.

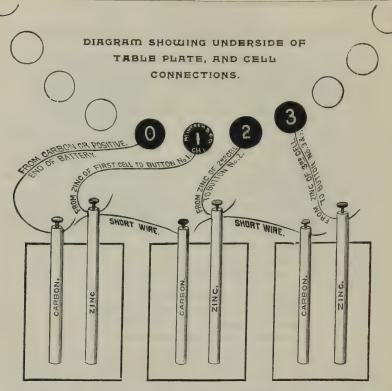
These cells when properly set up can be used for medical purposes for many months, requiring very little attention or expense. All work accomplished by any galvanic battery in the treatment of uterine fibroids by the powerful current recommended by Apostoli, can be accomplished with a battery of 40 Laclede, Diamond Carbon, Axo, Law, Fitch or Samson cells.

We have no special pecuniary interest in the sale of any particular make of chloride of ammonium cell, and do not guarantee the quality of any of them. We present the meritorious claims made by the manufacturers of the various batteries here shown, and we recommend those herein described as having given most satisfactory results according to the concensus of opinion of the most eminent physicians who are using them.

Give to your battery such attention as you would bestow upon your watch, or your case of surgical instruments; keep it clean and properly charged, and it will be always ready for use and will respond promptly and efficiently to your every demand for service.

We pack these cells with great care, and make no charge for packing cases or cartage. Our responsibility for damage to cells will cease when they leave our factory.

We employ experienced packers and all of our goods are carefully packed and delivered to the Railroad or Express Companies in good order; we will, therefore, not be responsible for damage to goods in transit.



DIRECTIONS FOR SETTING UP AND CHARGING GALVANIC CELLS.

Charging the Cells: Fill each jar two-thirds full of clean water, add a package (4 oz.) of sal ammoniac; stir with a stick of wood until all the salt is dissolved. Place the carbon and zinc in the jar, being careful not to get the fluid on the outside of cell or connections.

Connecting the Cells: Place the cells in a cabinet, or on shelves as desired, then connect zinc of first cell by means of a short wire, with the carbon of next, and so on until all are connected; (that is, zinc to carbon; zinc to carbon; zinc to carbon) and so on until all are connected in a continuous chain. See diagram of under side of table plate and cell connections.

TO CONNECT THE CELLS WITH THE TABLE PLATE.

Commence by connecting the carbon of the first cell with the "O" button, then the zinc from the first cell to the "1" button, the zinc of second cell to "2" button, the zinc of third cell to "3" button, etc. Sometimes the numbers on the table plate do not run consecutively, as for instance, 20, 22, 24, etc., in which case you would connect the zinc from twentieth cell to button "20," then skip cell 21 and run the next wire from the zinc of cell 22 to button "22;" then skip cell 23 and run the next wire from zinc of cell 24 to button "24," etc. In this way any desired number of cells can be attached to any table plate—sometimes skipping as high as five cells.

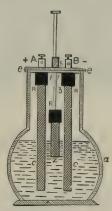
This diagram, showing cells and connections does not refer to any particular battery, but is intended to show how to connect the negative and positive elements of any form of cells in series, and with the table p'ate.

GRENET BATTERY.

This battery is especially adapted for experimental and illustrative purposes. It is a very desirable battery to furnish current for an induction coil, or to use in connection with the Gem Dental Battery, or to operate the Electro Magnet for removal of bits of steel from the eye. Also for use with the Electric Bullet Probe or the Electric Exploring Needle.

It occupies but little space and furnishes a large quantity current. The zinc can be raised from the fluid, so that the cell may be kept charged ready for use for many months, and can be set in action at any time when required, by simply depressing the brass rod (which slides through the center of cover), to which the zinc is attached.





GRENET BATTERY.

No. 1, 6 inches in height,	capacity	½ pint			\$ 2 00
11 2 8 11 11	3.3	7 16			2 50
" 3, 10 " " " 4, 12 " "	6.6	1 quart			3 50
4, 12	6.6	2 111			5 00
" 4, double, 12 inches in	height,	capaci	ty 3 qua	rt, with	
2 Zincs, 3 Carbons					10 00
" 5, 14 inches in height,	capacity	3 quari	t		12 00
" 5 double, 14 inches in	height,	capaci	ty 2 quai	rt, with	
2 Zincs, 3 Carbons					15 00
Extra Carbons forNo	o. 1.	2.	3,	4.	5.
Each	25c.	35c.		60c.	75c.
Extra Zincs forNo	o. 1 .	2.	3.	4.	5.
Each			30c.	40c.	
Extra Glass Jars for No	o. 1.	2.	3.	4.	5.
Each	50c.	60c.	75c.	90c. \$	1 25.

YORMULA FOR FLUID FOR THE GRENET BATTERY.

Use the formula for Bi-Chromate Fluid, or use Chromic Acid as follows. Four ounces of the Powdered Acid are dissolved in one quart of diluted Sulphuric Acid (commercial), 1 vol. Sulphuric Acid to 12 water, add 2 Drachms of Bi-Sulphate of Mercury. Stir well and allow to cool before using.

SWITCH BOARDS.



NO. 1 SWITCH BOARD.

No. I SWITCH BOARD.

Arranged to connect with galvanic cells, on polished hard rubber base, $5\frac{1}{2}x7\frac{1}{2}$ inches, single switch with twenty buttons, two binding posts and a pole changer.

Price, with single switch......\$ 8 00
Price, with double switch...... 10 00

No. 2 Switch Board.

5½x6 inches, polished hard rubber, single switch with ten buttons, two binding posts.

Price, with single switch.....\$6 00

Price, with double switch..... 8 00



NO. 2 SWITCH BOARD.



BATH TUB SWITCH BOARD.

This switch board is intended to be used where the party has a Battery, either Galvanic or Faradic, which he desires to connect with the electrodes in a bath tub. By means of the double switches the current can be carried through the electrodes to any part of the body.

The pole changer enables the operator to change instantly the polarity of the electrodes in the tub, without changing the connection of the cord from the Battery.

BATH TUB SWITCH BOARD WITH FARADIC COIL.



The Faradic Coil of this switch board is prepared with special reference to its use in electric bath treatment. The letters on the switch buttons refer to the electrodes as placed on the McIntosh bath tubs. By the use of this switch board in connection with one of the McIntosh bath tubs a very satisfactory bath outfit will be had at a minimum of cost. The only really complete

and entirely satisfactory electric bath apparatus, however, is the McIntosh Galvanic and Faradic Combined Bath Apparatus.

Price of	Bath Tub Swi	tch Bo	oard (See preceding page)\$10	00
1.1	4 4	ŧ 6	with Faradic coil 25	00
F 6	Cabinet Vapor	Bath	Switch Board 10	00
4.4	4.4	6.6	" with Faradic coil, 20	00

THE DE WATTEVILLE CURRENT COMBINER.

Price \$10.00

This instrument is made up of two polechanging switches. Two pairs of posts (G and F) receive the wires from the poles of the Galvanic and Faradic batteries respectively. The conducting cords in connection with the electrodes are connected with the opposite posts, thus by proper manipulation of the switches, either the Galvanic or the Faradic, or both currents combined may be carried to the patient.

The facility with which this pole-changer switch enables the operator to change from one pole to the other without changing cords or electrodes is a great convenience.





POLE CHANGER SWITCH.

Price..... \$2 40



OFF AND ON SWITCH.

Price......\$1.20



MCINTOSH No. 2 OFFICE TABLE PLATE.

This is an elegant piece of work, and will meet the wants of the profession where a less expensive battery is desired. The following accessories are neatly arranged on a polished hard rubber base 10x12 inches:

A galvanic double switch by which the operator is enabled to use cells from any part of the circle, thus obviating the necessity of using the first cells first. The buttons are arranged for 25 or more cells as the purchaser may desire; a Faradic Coil with polished hard rubber ends and cover; Pole Changer; two Binding Posts, from which the galvanic, primary or secondary Faradic currents may be taken by means of a switch; and a switch to connect the coil with one or more galvanic cells.

For information regarding Cells, see description and prices of same under head of "Chloride of Ammonium Batteries."



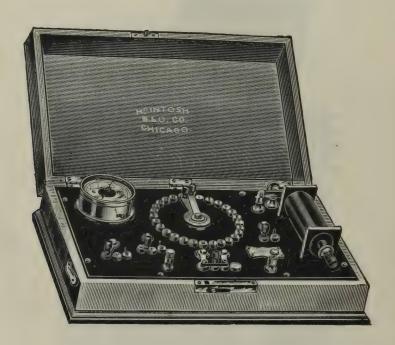
MCINTOSH No. 2 CABINET BATTERY.

This Cabinet has the No. 2 office table plate shown on preceding page, and is the most elegant and complete office battery in the world, for the same money.

We furnish this Cabinet in walnut or oak, as may be preferred, and the shelves are arranged to hold 40 cells.

Price as above, without cells\$64 00

For information regarding cells see description and prices of same under head of "Chloride of Ammonium Batteries."



MCINTOSH No. 4 OFFICE TABLE PLATE.

In addition to the accessories contained on the McIntosh No. 2 Office Table Plate, we furnish with this elegant plate, the McIntosh Milliamperemeter and controlling switch, all neatly arranged on polished hard rubber base size $9x15\frac{1}{2}$ inches.

The buttons of the galvanic circle are arranged for 40 or more cells as the purchaser may desire.

Price as above described in	mahogany	case\$6	8 00	
Price without case		60	0.00	

727 For information regarding Cells, see description and prices of same under head of "Chloride of Ammonium Batteries."



MCINTOSH No. 4 CABINET BATTERY.

This elegantly fitted Office Cabinet has the No 4 Office Table Plate shown on the preceding page. It is well fitted to hold the place of honor between the unrivaled but more expensive No. 1 Cabinet, and that peer of all inexpensive office batteries, the McIntosh No. 2 Cabinet Battery.

In addition to the accessories of the No. 4 Table Plate, we furnish the McIntosh Jewell Rheostat, Sponge Electrodes and Conducting Cords. The Cabinet is a handsome design in highly polished oak or walnut, with plate glass cover. The shelves are arranged to hold 40 cells.

For information regarding cells, see description and prices of same under head of "Chloride of Ammonium Batteries."



MCINTOSH No. 1 OFFICE TABLE PLATE.

This was designed by Dr. McIntosh to meet the want of physicians who desire a compact and complete office battery. The following accessories are arranged on a board of polished hard rubber, 12 x 16 inches: A Galranic Double Switch for forty or more cells; an Automatic Rheotome, giving fast or slow interruptions; Milliamperemeter; Pole Changer; Current Indicator; Binding Posts; large Faradic Coil, with polished hard rubber ends and cover; a Coil Rheostat of twenty-five coils, whereby from one hundred to fifteen thousand ohms' resistance can be brought into either the Galvanic or Faradic circuit, by simply moving the circular switch. This can be furnished in black walnut or polished oak case, on an office table or cabinet case. This is a very perfect and elegant piece of work, and receives the approval of physicians at sight.

Where this instrument is fastened to a table or other piece of furniture not having room for the cells underneath, they may be placed in a closet or cellar

out of the way, and require very little attention.

Price as above described	in Polished Walnut or Oak Case	\$108 00
Price, without Case		100 00

The For information regarding Cells, see description and prices of same under head of "Chloride of Ammonium Batteries."

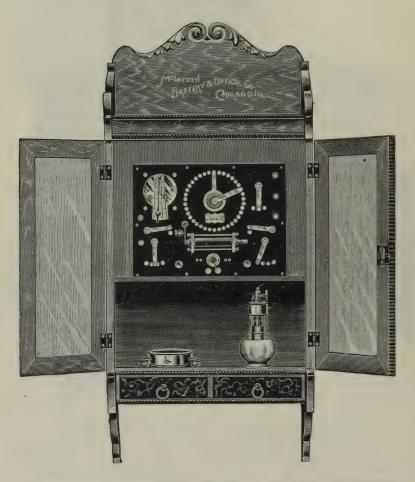


MCINTOSH NO. 1 CABINET BATTERY.

This apparatus has the No. 1 table plate as shown on preceding page. The case is in polished black walnut or antique oak, with drawers for electrodes and a sliding shelf. The cell-drawers can be drawn out for examining their contents without disconnecting or disarranging the connections between cells and table plate; they will hold 48 Diamond carbon cells; 48 "Gonda Leclanche;" 42 "Law;" or 42 McIntosh Laclede cells. The connecting wires which convey the current from the cells to corresponding parts of the table plate, are gathered in a bunch and pass down inside the case and behind thedrawers. The square of the top is 22 x 40 inches; height 3 feet. Any desired number of cells can be furnished.

McIntosh Single Circle Office Plate.

IN WALL CASE.



In case of polished walnut or oak, with beveled plate glass door, hydroplatinum Rheostat and Milliamperemeter connected in circuit.

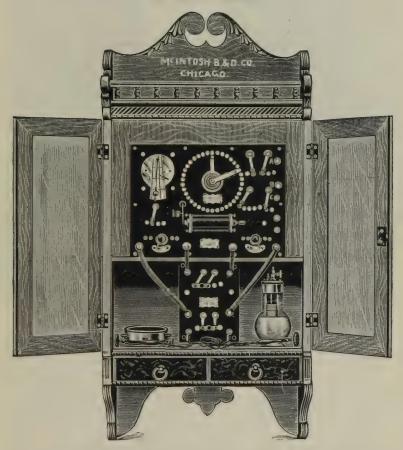
Price,	as shown in cut\$132	00
1.6	without Rheostat or Milliamperemeter 88	00
**	with Milliamperemeter and McIntosh Jewell Rheostat	

For information regarding Cells, see description and prices of same under head of "Chloride of Ammonium Batteries."

McIntosh Complete Wall Plate

WITH

DE WATTEVILLE CURRENT COMBINER IN WALL CASE



In case of polished walnut or oak, with beveled plate glass doors, hydroplatinum rheostat and McIntosh milliamperemeter connected in circuit.

Price.	as shown in cut\$148 (0(
8.6	without rheostat or milliamperemeter 104 (00
6.6	with McIntosh Milliamperemeter and McIntosh	
	Tewell Rheostat	00

For information regarding cells, see description and prices of same under head of "Chloride of Ammonium Batteries."

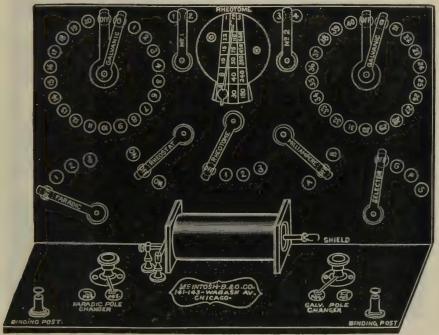


THE LITTLE GEM CABINET.

THE LARGE GEM CABINET.

As shown in the accompanying cut, is just what its name indicates, a "Little Gem." In this cabinet of polished oak, size 20 inches wide by 5 feet high, we furnish a most complete office battery, comprising double galvanic circle switch board; giving the physician two distinct 20 cell batteries capable of being used separately, or (by simply moving the arm of a switch) bringing the two batteries into one circuit of forty cells; faradic coil operated by three distincs cells; graduated automatic rheotome, connected by switches with both the galvanic and faradic current, and adjusted so as to furnish from 6 to 660 interruptions per minute; faradic pole changer; galvanic pole changer; milliampere meter switch; rheostat switch; selector switch and binding posts. On a shelf above the switch board is placed the McIntosh milliampere meter; the McIntosh Jewell Rheostat, and galvano-cautery rheostat and binding posts for cautery current. The space below the plate can be used for cells, or the cells can be placed in basement or closet, as preferred. In connection with the galvano-cautery rheostat are two 75-ampere storage cells placed in space behind the battery plate.

 We furnish conducting cord, handles and sponge discs with the Little Gem Cabinet, but do not furnish galvano cautery cord except at an extra charge of \$3.50.



FRONT VIEW OF LITTLE GEM CABINET BATTERY PLATE

Exhibit of McIntosh Battery and Optical Co.

.... AT THE ...

WORLD'S COLUMBIAN EXPOSITION.

REPORT OF JUDGES.

FIRST. "Electro Medical, Dental and Surgical Apparatus is worthy of an award.

"It consists of a full line of appliances such as are used by physicians, surgeons and dentists when employing electricity for diagnostic or therapeutic purposes.

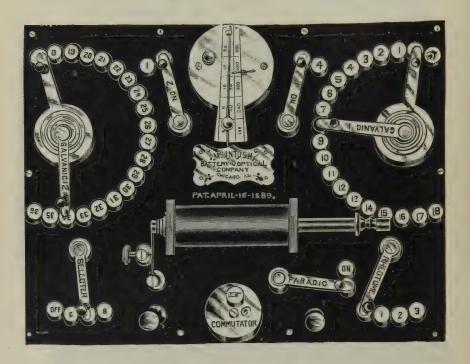
SECOND. "We recommend an award for the variety of the exhibit and the excellence in design and workmanship of the various articles."

(Signed) W. J. HERDMAN.

Concurred in by Professors

BARKER, DOLBEAR, SHRADER.

From a perusal of the above you can readily see why we received Highest Award and Medal.



MCINTOSH COMBINED DOUBLE SEMI-CIRCLE TABLE OR WALL PLATE.

This Table Plate is not only elegant in design and attractive in appearance, but has no superfluous accessories, and is especially sought after where it is desirable to economize room in the office, when it can be encased in one of our elegant polished wood cases and fastened to the Wall. It can also be mounted on a cabinet similar to the No. 1; in either mounting this plate makes an elegant and useful office battery.

Price, Plate as shown in cut	50 00
Price, Plate in Polished Wood Wall Case, with plate glass	
door and space for milliamperemeter and hydro-	
platinum rheostat	75 00
Price, Plate Mounted on No. 1 Cabinet	00 00

12 For information regarding cells, see description and prices of same under head of "Chloride Ammonium Batteries."

DIRECTIONS FOR USING THE McINTOSH COMBINED SEMI-CIRCLE TABLE OR WALL PLATE.

1st. If it is desired to obtain a Galvanic current by using "No. 1" semicircle independent of "No. 2," place the selector on G, the Faradic on "Off" button, No. 1 switch on 4, No. 2 switch on 2, and in the large semi-circle, one of the double switch levers on the "O" button, the other on the button corresponding to the number of cells wanted in circuit, which current is manifested at the two binding posts on either side of the Commutator.

2d. If it is desired to obtain a Galvanic current by using "No. 2" semicircle independent of "No. 1," proceed as above, except that "No. 1" switch is on 3, and "No. 2" switch on 1.

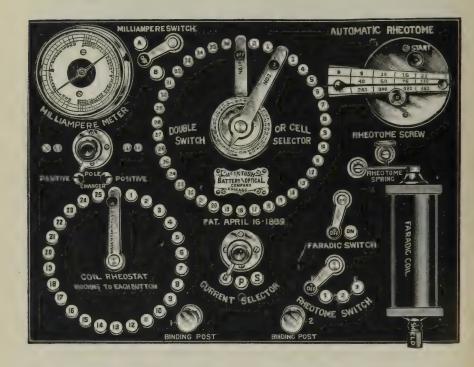
3d. If a Galvanic current is desired from a part or all of both semi-circles combined, manipulate the double switch levers in the semi-circles as previously directed, according to the number of cells desired; "No. 1" switch on 3, "No. 2" switch on 2,

4th. The Rheotome is principally for interrupting the Galvanic current, and can be used in any of the three sections of directions given above in this way: If the Rheotome switch is on the "O" button, it is not in circuit; if the switch is on the "1" button, and the ball on pendulum is down to the bottom row of figures (see cut), you would get six interruptions per minute; if the switch were on 3 (the ball as before), you would get 180 interruptions per minute. As the pendulum ball is raised opposite the other rows of figures, we get the interruptions as indicated on the Rheotome in the scales 1, 2 and 3 by using the corresponding numbers, 1, 2 and 3 on the Rheotome switch.

5th. If it is desired to use the coil or Faradic current, manipulate the double switch levers in the semi-circles, as directed in sections 1 or 2, and place the Faradic switch on the "On" button; the selector on P if the primary current is wanted, or on S if secondary; always remembering that two or three cells are sufficient to run the Faradic coil.

6th. The commutator, or pole changer, is used in either Faradic or Galvanic current, and explains itself. When the hand is pointing to the right, the right hand post is the positive, and the left hand post negative. When the hand is pointing to the left, the left hand post is positive and the right hand post is the negative.

MCINTOSH No. I TABLE PLATE.



FACE VIEW.

We consider our No. 1 Office Table Plate to be the ne plus ultra of office switch boards.

A complicated arrangement of switches produces "a startling impression" on the mind of the uninformed patient. But for real service, ease of manipulation, and entire satisfaction to the practitioner in addition to impressive effect, the McIntosh No. 1. Office Table Plate has no competitor.

THE ACCESSORIES SPEAK FOR THEMSELVES.

See full description and price of the McIntosh No. 1 Office Table Plate elsewhere in this catalogue.

We take a just pride in such words of commendation of the products of our manufactory as we find in the Preface to 2d Ed., "Plain Talks on Electro-Therapeutics," by Horatio R. Bigelow, M. D.—"Many new cuts of instruments made by the largest manufacturing establishment in this country are introduced, because personal acquaintance with them has demonstrated their reliability and value."

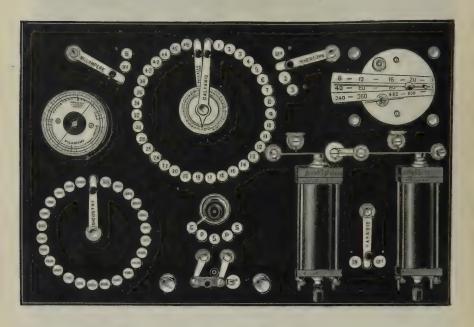


McINTOSH No. 3 TABLE OR WALL PLATE, WITH CURRENT COMBINER SWITCH.

This style of plate has become quite popular, and is intended to be used on a circuit of possibly 50 or more cells connected for intensity, with only the terminal ends coming to the table plate. The current is controlled by a Hydro-Platinum Rheostat, or by the McIntosh Current Controller, and registered by the Milliampere-Meter, both of which are in circuit from the two binding posts. Three or more cells, independent from the Galvanic circuit, are added for operating the Faradic coil. A graduated Automatic Rheotome for interrupting the Galvanic current, giving from 6 to 660 interruptions per minute, with switch for operating same, and a current selector by means of which the Galvanic, Primary or Secondary Faradic, or the combined Galvanic and Faradic currents may be taken at the same binding posts, are also embodied in this elegant plate.

Price, McIntosh No. 3 Table Plate\$44 00	
Price, including McIntosh Milliamperemeter and Hydro-	
Platinum Rhoestat	
Price of Plate mounted in Wall Case 84 00	

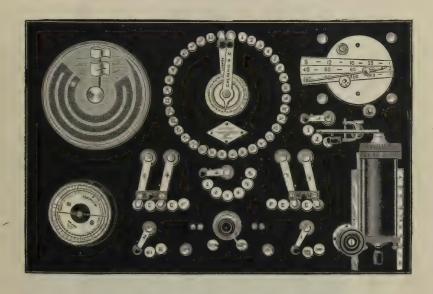
For information regarding Cells, see description and prices of same under head of "Chloride of Ammonium Batteries."



MOINTOSH "SPECIAL" No. 1 TABLE PLATE.

This plate was constructed at the request of a leading teacher of electrotherapeutics in one of our prominent medical colleges, and gives the full range of galvanism and faradism. It is larger than our regular No. 1 Table Plate, being 13 x 20 inches, and embraces the same accessories, except that the faradic coil on the No. 1 is replaced by a double coil, one having the ordinary vibrator, the other a "singing rheotome." The secondary coils are made to slide over the primary after the Dubois Reymond style, and are four in number, of different thickness and length of wire, giving a very wide range of variation of currents. They are interchangeable, each one being adapted to either primary.

Price of Special No. 1 Plate only, as above\$135	00
Price of Plate in polished oak or walnut case with beveled	
plate glass cover	00
Price of Plate mounted on No. 1 Cabinet. 185	00

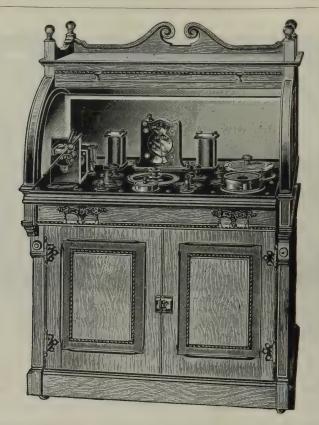


MCINTOSH NO. 5, TABLE PLATE.

The essential features of this plate are that the galvanic and faradic currents are produced from separate and independent batteries; the primary and secondary faradic currents can be used separately, or the combination of both may be utilized at the same time; the galvanic and faradic currents can be used separately or, by the aid of the combiner both can be used at the same time; the "Meirdirk" rheotome which is capable of giving from 50 or 60 interruptions up to many thousands per minute; two secondary coils, one wound with 800 yards of coarse wire and tapped at 500 yards, the other wound with 1,500 yards of very fine wire and tapped at 1,000; the McIntosh "Jewell" rheostat milliampere meter, current selectors, cell selectors, automatic rheotome pole changer, etc. Size of plate 13 x 20 inches.

Price, McIntosh No. 5 Table Plate, only	\$135	00
Price of Plate in Oak or Walnut Case, with Plate Glass		
Cover	145	00
Price, mounted on Oak or Walnut Cabinet, style of No. 1	185	00

For information regarding cells see description and prices of same under head of "Chloride of Ammonium Batteries."



THE MCINTOSH STANDARD CABINET BATTERY.

This elegant piece of work stands four (4) feet in height, thirty-five inches long and twenty-six inches wide. It is equipped with the most complete line of durable accessories ever put into one combination, and although originally designed expressly for exhibition at the World's Columbian Exposition, it called forth such praise from the judges and the medical profession generally, that we have concluded to keep it in stock.

The accessories are tastily arranged on a sliding base of velvet-finished hard rubber, eighteen by thirty inches, and are all of the very best workmanship and material.

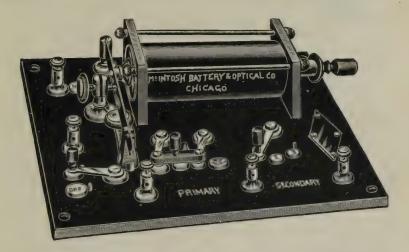
The "Tripier Induction Apparatus," is from the formula of the one being used by Dr. Apostoli, and other eminent French specialists; it has three (3) secondary bobbins of different thickness and length of wire, and an interrupter giving from twenty to five thousand interruptions per minute; a double pointer for selecting cells; a rheostat composed of German silver wire coils interposing from 0 to 16,000 ohms resistance into the circuit; an improved

upright graduated automatic rheotome by which the galvanic or faradic current can be interrupted from eight to six hundred times per minute; a current combiner enabling the operator to use both primary and secondary currents at the same time, and another for using both galvanic and faradic at the same time; a milliampere meter with switch for operating the two scales; a switch for using independent cells for operating the coil, and one for using cells from the galvanic current for the same purpose; a commutator or pole changer and two binding posts.

All the wires from the cells are attached to binding posts at the back of the cabinet so that connections may be easily examined.

The space below the plate is sufficient for fifty Laclede or other cells of like size.

Price, including 43 cells..... \$500 00

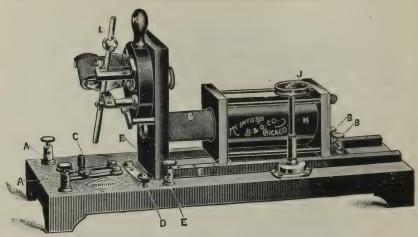


MCINTOSH FARADIC TABLE OR WALL PLATE.

With Singing Rheotome.

It has been proven that the current from the coarse wire secondary coil with slow interruptions develops muscular growth, and the current from the fine wire secondary with high frequency interruptions produces an anæsthetic effect; but the cost of an apparatus with separate secondary coils and adjustable vibrator has heretofore been too expensive and complicated for physicians who have not sufficient time to devote to the special application of electricity. This apparatus, having a good primary, three secondary windings of different thickness and length of wire, pole changer, and adjustable rheotome for giving coarse or high frequency interruptions, will be found admirably suited to meet most of the requirements heretofore supposed to be gotten only by more exsensive apparatus.

Price. \$24 00



TRIPIER INDUCTION APPARATUS.

Used by Dr. Apostoli, Dr. Ranvier, and Other Eminent Specialists.

Price.	, with three coils, without cells	\$90	00
6.6	as above, including 6 axo cells	96	00
8.4	including Partz Motor Battery and sulpho-chromic salt	96	00

This apparatus is furnished with three coils of different thickness and length of wire: one of which (H) is shown in the cut. A, A, are the binding posts to which the cells or battery is attached. B, B, the posts to which the cords going to the patient are attached. C, the pole changer or commutator. D, contact button, which, when pressed, stops the current. E, E, posts for taking the current from the primary coil. F, graduated scale. G, primary coil. J, rack and pinion for sliding the secondary coil backward and forward over the primary. The more the primary coil is covered by the secondary, the more intense will be the current. K, handle by which to increase or decrease the number of interruptions made by the bar L. By moving the handle, K, from the operator the interruptions are slower, and vice versa, permitting a variation of from 50 to 3000 interruptions per minute, and is used principally for allaying pain, (especially within the uterus) by producing anæsthesia of the sensory nerves, for exciting the deeper seated fascia in paralysis, atrophy, etc.

This apparatus is peculiarly adapted to the operation of GENERAL FAR-ADIZATION BY THE BIPOLAR METHOD.

Dr. A. D. Rockwell-in the Medical Record-says: "There is one method, however-the bipolar-which seems to be a special field for the faradic current, and in which the use of the galvanic current is seldom desirable. By bipolar faradization is meant the localization of the faradic current by means of a single electrode, and the method is confined for the most part to internal treatment, i. e., to the treatment of the vagina, the uterus, the rectum, and the bladder. From the primary coil, as the electrodes are held in the hand, or placed on any portion of the external surface of the body, the current seems comparatively mild and inefficient, while the current from the secondary coil acts with far greater vigor. It not only more vigorously contracts muscle, but excites the cutaneous sensibility more acutely and the retina more vividly than the current from the primary coil. Apply, however, this current (primary coil) directly to the bladder, the rectum, the vagina, and especially to the involuntary muscular fibers of the uterus, and a very remarkable and interesting change is observed. It will be found that the current from the first helix acts with astonishing and most unexpected vigor on both sensory and motor parts." "We may say that the currents have elective properties or properties special to each, but the reciprocal relations between the nervous system and the action of electricity are not yet sufficiently understood to offer a satisfactory explanation of the interesting fact that in external local faradization the current of tension is the most effective, both as to objective and subjective symptoms, while in internal local faradization the so-called current of quantity acts most vigorously. If instead of using the unipolar method—one pole internally and the other externally—we use a bipolar electrode, and in this way treat the vagina, the uterus, or the rectum, the current from the first helix will act with increased vigor, an increase that cannot be altogether accounted for by the decreased resistance that is necessarily offered.

Although around the primary coil of an ordinary induction apparatus extra and distinct coils of finer wire up to the number of nine can be wound, the current from each successive coil becomes weaker and weaker, and experience has shown that for all practical purposes there is need for but two belices, that yield the primary and secondary induced currents." "Both currents, and especially the current from the combination of the primary and second induction coils act as powerful muscular tonics when applied internally, and are capable of exciting contractions of the involuntary muscular fibers of the uterus of every degree of severity. For this reason it is invaluable in cases of post-partum hemorrhage, and must, it seems to me, prove far superior to ergot for its suppression, since it acts instantaneously, and with a force just sufficient to accomplish the object desired. In the ordinary form of subinvolution the current from the primary and second induction coil is invaluable. Bipolar intra-uterine applications persistently repeated and with a strength no greater than can be readily borne by the patient, will afford results so gratifying that no one who has once had experience in the method will wish to treat a case of subinvolution without its aid. In regard to the action of the primary induction coil, in its external application, I have, I am confident, observed certain effects worthy of citation. Some cases of hyperæsthesia of the scalp and face, and not a few cases of pain of a true neuralgic type and superficial in character, are more readily relieved by this current than by any proceeding from the pure induction coils unassociated with the battery influence." "Therefore, in the operation of general faradization, when we desire to obtain the best constitutional tonic effects that electricity is capable of giving, we resort to this combination of the coils."

When persistent failure follows endeavors along this line of electrization, the cause of failure must be attributed to hasty and faulty methods of administration. Even more marked is the difference in the action of this current of tension and current of quantity in bipolar faradization of the rectum, vagina, and uterus. Its comparatively mild action on the motor and sensory nerves, coupled with its great power of overcoming resistance, render it par excellence the current for the relief of pain. "It is no exaggeration to say that in many cases of pain associated with uterine disorder it acts with almost magical effect."

THE TRIPIER INDUCTION APPARATUS with its three bobbins of different thickness and length of wire, modifying in any degree of quantity or intensity the induced current, and by the aid of the automatic adjustable rheotome giving slow or rapid interruptions furnishes to the practitioner every conceivable variation of electric induced force.



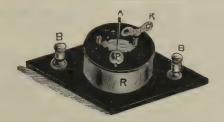
MCINTOSH FARADIC PLATE.

With Meirdirk Rheotome.

With the great improvements in the apparatus for its production faradism has taken high rank, especially for the relief of pain and the development of muscular tissue. It has recently been discovered that a short heavy wire for the secondary coil with slow interruptions is preferable for muscular development, while a long, fine wire with very rapid interruptions produces sedation or so-called anæsthesia. To produce these various effects it was heretofore necessary to have more than one apparatus, but the plate here shown gives the full range of faradism both as to the number of interruptions and length of wire in the secondary coils. The "Meirdirk" rheotome is the most unique interrupter ever yet invented and the interruptions can be varied at the will of the operator, from 50 or 60 up to many thousands per minute simply by the moving of the vertical lever backward or forward. Moving this lever from the operator makes the interruptions slower, while moving it in the reverse direction they become more rapid until a point is reached when the current from the battery is broken and all action ceases. This latter feature precludes the necessity of detaching the battery cell from the plate when not in use, as all that is necessary is to throw the rheotome lever as far to the front as it will go and the current is entirely cut off from the coil. In this apparatus the secondary coils are made to slip over the primary after the Dubois Reymond style, and are four in number. The one marked "0" is wound with insulated copper wire, the length of which is 5,200 feet or nearly one mile. No. 1 coil has 1,220 feet of No. 32 copper wire; No. 2 coil has 440 feet of No. 23 copper wire, and No. 3 coil 157 feet of No. 18 copper wire.

The apparatus is of the finest workmanship, neat and attractive in appearance and the most desirable for the price ever yet offered to the profession.

Price as above with four separate secondary coils......\$48 00

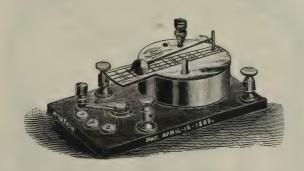


SIZE OF BASE 7 1/2 x41/2 INCHES.

AUTOMATIC RHEOTOME.

This Rheotome can be connected with any galvanic battery, to give slow or rapid interruptions of the current. It is put up with a polished hard rubber top and base and nickel-plated sides; all the metal work is nickel-plated. It occupies but little space, and is as durable as a clock.





GRADUATED AUTOMATIC RHEOTOME.

Price \$15 00.

This instrument may be adjusted so as to furnish from 6 to 660 interruptions per minute. It may be introduced into either the Faradic or Galvanic circuit, and can be used with any style of battery.

Dr. Wellington Adams, in his work, Electricity, its application in Medicine and Surgery (Vol. 1, page 90), speaking of the Graduated Automatic Rheotome, says: "The best instrument of this kind now upon the market is manufactured by the McIntosh Battery and Optical Co. of Chicago."



GALVANOMETERS.

Price,	small	siz	e.				۰				۰	\$3	00
6.6	mediu	m	size	٠	0	۰	٠			۰		4	00
6.6	large		4.6		٠							6	00

Large size, base 4x7 inches

THE VALUE OF ELECTRICAL MEASUREMENT.

Dr. Adams in his recent monograph on electricity, says: "In no science is a knowledge of general principles and natural laws so essential at every step as in the case of electrical science. Its laws are multiple, varied and complex, and a thorough understanding of them is necessary for a correct interpretation of the numerous phenomena which are ever and anon manifesting themselves." "Electricity, however, is a definite quantity capable of producing with uniformity, certain physical, chemical and nutrient changes, whenever we come to understand the laws governing its action and learn to apply it with methods of precision." "The physician who imagines that he can deal with electricity as a remedial agent and secure anything approximating uniform results without the use of reliable measuring instruments, will find himself as much at sea as the mariner without his compass, the carpenter without his rule, or the pharmacist without his scales."



MCINTOSH MILLIAMPERE METER.

Diameter of Base, 51/2 inches. Price, \$20.00.

Our instrument is manufactured with great care, and in point of cheapness and quality it is not surpassed by any similar instrument. It is not offered as an instrument of absolute test or precision, but as a convenient, safe and inexpensive guide to the practitioner in his therapeutic work. Many hundred of these milliampere meters are in use in the hands of physicians, whose judgment in regard to their reliability and approximate accuracy will not be questioned.

HOW TO USE THE

MCINTOSH MILLIAMPERE-METER.

This instrument is designed for measuring a galvanic current while passing through the human body, and not for testing cells. When used for the latter purpose, a resistance coil, or its equivalent, should be introduced into the circuit. Never send a current from a single cell, or a series of cells directly through it, without resistance in the circuit.

The Milliampere-meter should be as far as possible removed from the influence of permanent magnets when in use.

SCALES. The *longer* scale is graduated from 0 to 1,000 Milliamperes each division to thirty marking 5 M. A., and increasing in the number indicated, according to space, up to 1,000 M. A. The *shorter* scale marks from 0 to 20 M. A., the spaces from 0 to 5 being divided to indicate half Milliamperes.

DIRECTIONS FOR USING THE INSTRUMENT. 1. Release the Indicator by sliding button D to right.

- 2. Turn the instrument so that the Indicator points due east and west; when it rests at 0, adjust the leveling screws until it is perfectly horizontal.
- 3. TO USE THE LONG SCALE. Connect cord from positive pole of battery to post C, and another cord from post A to electrode. From the other electrode connect cord to negative pole of battery, and then place the electrodes where desired.
- 4. TO USE THE SHORT SCALE. Detach cord from post A, and place in post B, and use same as before.

This instrument is graduated by standard measurements, and must be regarded as the standard for a given battery, instead of regarding the battery as the standard by which it is to be gauged. If it fails to measure the current, look for resistance in the circuit, or feeble battery power. It is a most delicate test of the current actually passing through the patient, irrespective of what ought to be passing through the circuit.

The Indicator has a fine agate center, poised on a polished, hardened steel point, making the bearing extremely delicate; any hard usage, such as falls or concussion, may impair the movement and destroy the usefulness of the instrument.

Price\$20 00



MCINTOSH POCKET MILLIAMPEREMETER.

Diameter, 31/4 inches.

Price.....\$25 00

This instrument is handsomely finished and placed in a velvet-lined morocco case, and is essentially the same in point of finish and accuracy as the larger instruments.

A FEW SUGGESTIONS

ON THE

USE OF THE MILLIAMPEREMETER.

In the use of electricity for any purpose, the question of resistance comes up at every step, and must be considered by the physician in every operation in which he uses this force as a Therapeutic agent. To many the following suggestions are well understood, but are applicable to those who have not given much study to physical electricity. It is also to answer the question, which is many times daily asked: "How many Milliamperes will my battery give me?" or, "You sold me a battery and told me it would give me 200 Milliamperes, or 100 Milliamperes; now I have tried it with all my cells turned on, with one electrode in each hand, and I find it only registers about 5 Milliamperes. What is the matter? Where is my 200 Milliamperes to come from?"

Many of these questions are asked unadvisedly, and would never be given utterance did the speaker, or writer, give them due consideration; as for instance, it is quite a common occurrence for a bright and intelligent-looking customer to enter our salesrooms, and, pointing to a microscope (without objective in it) remark: "What is the power of that instrument?" or, "How many diameters does it magnify?" and when we answer that it all depends upon the objective and eye-piece, he sees it at once, and says, "Oh yes."

Now there is just as much reason in asking how many diameters a microscope will magnify, as how many Milliamperes a battery will give. But, to make the matter more plain, we will say:

First. The amount your Milliamperemeter registers depends altogether on the amount of resistance in the circuit.

Second. With one electrode in each hand, and the entire 30 or 40 cells turned on, your Milliamperemeter would probably only register about 5 or 10 Milliamperes. Why? Because the resistance of the whole human body is in the circuit. This varies in different individuals from 5,000 to 10,000 ohms; therefore, 5 Milliamperes would indicate a very good current.

Third. In the Apostoli method of removing fibroid tumors of the uterus, with the same number of cells in circuit, as above; with one large electrode upon the abdomen, and working within the uterus, upon a mucous surface, your resistance would be reduced to a minimum, and you would get with this same number of cells about 150 to 250 Milliamperes. Why is this? Because there is only about 150 ohms resistance in the circuit.

Fourth. Turn on about 10 cells of a Galvanic current, with the Milliamperemeter in circuit, and place the cord-tips on your tongue and see what your meter registers. (Low resistance.)

Fifth. Place the cord-tips in a piece of raw meat and see what your meter will register with a few cells. (Little resistance).

Sixth. One single cell with no resistance gives about 1,000 Milliamperes. Seventh. Never attempt to give a patient 100 or 200 Milliamperes through the body, even if you have the cells to produce it, because it might produce death.

Eighth. The human body has double the resistance of the entire Atlantic cable.

Ninth. The human skin is a very high resistance surface.

Lastly, mucous surfaces give very low resistance. You will have no trouble having your Milliamperemeter register 200 Milliamperes with 25 or 30 good chloride of ammonium cells in circuit, in removing fibroid tumors of the uterus; because they are not treated by passing the current through the body from one hand to the other.

We frequently have letters stating that the various authors recommend 50, 100, and even 200 Milliamperes dosage; and they ask: "Why cannot we get this number of Milliamperes? We only ask these parties: "Do these authors, whom you cite, say to give the patient 50, 100 or 200 Milliamperes through the resistance of the entire body?"

Of course you can plainly see, from these foregoing remarks, that the question of resistance, as we said before, comes up in every step of an operation where electricity is used, and should be so considered.

With the three fundamental questions of electricity, that is, amperage, resistance, and electro-motive force, well-understood by the physician, such questions will not in future be asked so frequently.

If, during an operation, your Milliamperemeter does not give you the amperage you think it should, do not say the Milliamperemeter is wrong and cast it aside, but look for the fault some place else. Possibly your cords are faulty; this is a frequent occurrence, and should be looked into every time; or, some of the connections are not made properly. Look your battery all over, try it with wires instead of cords, and if it does not work right, the fault then should be remedied by some one who is skilled in repairing these instruments



McIntosh Milliampere Meter WITH REFLECTING MIRROR.

Price......\$28 00



JEWELL STANDARD MEASURING INSTRUMENTS.

MANUFACTURED BY THE

McINTOSH BATTERY AND OPTICAL COMPANY

Under the Personal Supervision of the Patentee.

We do not call this instrument an indicator, neither is it a complicated laboratory galvanometer too fine and delicate for the amateur to handle, but in the Jewell Meter we offer to electricians and the medical profession a meter that is perfectly portable, light, compact, easily handled and easily read, not liable to get out of order and at the same time a standard. A standard portable instrument must be absolutely unaffected by outside magnetic influences, such as fan motors, permanent or electro-magnets, dynamos, etc. To be thus uninfluenced it must have no iron or steel in its moving system. The only instruments which in practice have given satisfaction are those of the D'Arsonval type, where the motion of the index is produced by a coil of wire pivoted in the field of a permanent magnet, but all of these instruments have been open to the criticism of being influenced by the loss of strength of the magnets, thus changing their calibration. In the Jewell Meter this fault has been overcome by adopting an entirely new form of magnet and magnetic circuit, so designed as to prevent the magnets losing their strength.

The Jewell Meter is extremely light and compact; uninfluenced by any other force than that of the current it is measuring; and a dead-beat instrument. The moving system swings in a special form of jeweled bearing, designed and manufactured especially for this instrument.

Each instrument is calibrated and tested by standards established by

scientific usage, under the immediate supervision of the inventor, Mr. Edward W. Jewell, M. E. None but the best material and workmanship are used in its construction. The instrument and carrying case complete will weigh less than three (3) pounds.

As the science of electro-therapeutics becomes better understood, there is a gradual departure from the primitive methods of applying the electric current. In this, as in all of the sciences, the earlier eras were eras of experiment. Man has at his command a new agent for the relieving of pain and the curing of disease. But it was left for him to discover by careful and painstaking experiment the way in which it could be best applied.

The first methods were necessarily empirical, but as the science becomes better understood, more exact laws take the place of earlier practice. With more exact methods, prompted by better knowledge came a demand among physicians for standard measuring instruments to take the place of those now in use, which only approximate accuracy.

Appreciating this demand, and always endeavoring to be in the fore front with the most approved apparatus, the McIntosh Battery & Optical Company have placed upon the market a line of measuring instruments which they can guarantee as standard.

The Jewell instruments embody all of the latest and most approved scientific principles of instrument building and will be found by our patrons to be thoroughly reliable in every particular, and to outrank the earlier instruments in all essential vantage points of construction, durability and convenience in use.

We wish to call particular attention to the following points of merit:

- 1. The Jewell Meter is absolutely uninfluenced by neighboring magnets, motors, dynamos, etc.; the only force which will deflect the needle is the current to be measured.
- 2. The Jewell Meter is perfectly portable and can be used in any position, either horizontal, inclined or upright. Each instrument is furnished in a neat carrying case, either mahogany or leather, as the purchaser may prefer.
- 3. In the Jewell Meter there are no metal parts in the enclosing case on which wires can be short-circulated.
- 4. The Jewell Meter has two (2) scales, one being arranged to read from the side of the instrument, and the other from the top.
- 5. The Jewell Meter is provided with a mirror by which to avoid parallax errors in reading the scale.
- 6. The scale is open and exceedingly easy to read: The scale divisions are equally spaced.
 - 7. The range of reading of each instrument is exceedingly great.

The milliampère meter reads from 0 to 300 milliampères, each small scale division being 2 milliampères.

A pole changer is placed in the instrument circuit so that current flowing in either direction may be measured without disconnecting the wires from the binding posts. This is a very desirable addition to a meter where the needle moves in but one direction, since it is often needful in electro-therapeutic work, especially in electric diagnosis, to change the direction of the current without disturbing in any other respect the arrangement of the appliances used.

If from short-circuiting or other hard usage the needle should become bent so as to stand slightly away from the zero point, it may be brought again to zero in the following manner:

Remove the round hard rubber base from the instrument by unscrewing the six small wood screws, there will then be seen three round-headed screws which are in long slots; loosen these screws slightly and turn the inner brass piece relative to the outer brass piece; this will cause the screw head to move along the slot slightly until the needle is brought to zero. The screws should then be tightened up again and the hard rubber bottom replaced. On no account should any other screws be tampered with.

In addition to the milliampere meter we manufacture a combined Milliampere Meter and Volt Meter, and a complete line of Am-Meters and Volt Meters, under the Jewell patents.



THE JEWELL MILLIAMPERE METER.

Price, in mahogany velvet-lined case	3 00
Price of Combined Milliampére Meter and Volt Meter, in mahogany	
velvet-lined caseNet, 60	00

If it is desired, we can furnish case of seal morrocco, velvet-lined, with shoulder strap. Extra, net, \$2.50.

RHEOSTATS.

The use of the Rheostat is to modify the intensity of a current of electricity by passing it through water or resistance coils.

By its aid, the physician can gradually increase the power of a current without shock to the patient, which is indispensable in treating the organs of special sense, brain, etc.

These instruments can be used with any make of battery.

WATER RHEOSTAT.



There is a prevalent custom, especially in the East, of connecting up sixty or seventy cells for tension, bringing the terminal ends of the Battery to the switchboard, and then controlling the current with the rheostat and measuring with the milliamperemeter. This has many objections which the busy practitioner has probably not had time to consider, and as these objections are sustained by the physical laws of electricity as well as by the experience of those best posted in its therapeutic use, we deem it due to the profession at large to call attention to these objections.

It must be remembered that a rheostat reduces the ampereage much faster than it does the voltage, and consequently by its use we get a current of tension which is more painful than the current obtained from just the number of cells to produce the needed current without the rhoestat being in the circuit. Always have as little external resistance in the circuit as possible. To illustrate more fully, let us suppose in some gynecological operation we wish a current of 100 milliamperes. Now if all our sixty or seventy cells are turned on and the current controlled by a rheostat and the milliamperemeter made to read 100 milliamperes, we would find the current so painful that but few patients could stand it: but if we had on our battery a selective switchboard, we could bring into circuit half the number of cells, or as many as we thought would furnish current sufficient for the operation, and then control it with the rheostat, and the current would not be nearly so painful. Again, it would be almost an impossibility to get a satisfactory current of from 11/2 to 2 milliamperes, such as would be indicated in the removal of superfluous hairs, by controlling the current with the rheostat. We could indeed get the 11/2 or 2 milliamperes easily enough but the patient could not stand the pain of even this small current on sensitive organs, under its high tension.

From the above we deduce that the use of the selective switchboard does not preclude the use of a good rheostat on the same board, because we can always bring into action the number of cells we think we shall need in a certain operation and then control the current with the rheostat. We believe the rheostat on a Table Plate is not more indispensable than a selective switchboard on the same plate—the two go well together.



McINTOSH HYDRO-PLATINUM RHEOSTAT.

The Rheostat figured in the cut is one devised for the special object of rendering it possible of increasing or decreasing the strength of the current in absolute gradual gradations, from zero to the full current strength and back again. Between two small, thin sheets of platinum (D D) suspended in water with suitable attachment (A) for one pole of the battery is suspended a third piece of platinum (E) with pointed end, that can be lowered or elevated gradually in the water between the other two sheets (D D), by means of a delicate ratchet combination (B C) above. This plate is connected with the other pole of the battery by one of the binding posts (A). When plate E is elevated so that its pointed lower end is out of the water, no current can pass the instrument, but as it is gradually lowered into the water, the resistance becomes gradually less and less, until the desired current strength is reached, or until the full capacity of the battery is obtained. Thus by elevating or lowering this central sheet, a current of great strength can be perfectly controlled in gradual gradations, no shock being possible.

Price..... \$24 00



THE MCINTOSH "JEWELL" RHEOSTAT.

The inlaid rheostat designed by Mr Edward W. Jewell, which we catalogue for the first time, is manufactured by the McIntosh Battery and Optical Company, to meet the demand for a thoroughly reliable controller. The essential features of the rheostat are: A disc of slate mounted on a wooden base, having an arm centrally pivoted and provided with three brushes which make contact with the resistance composition, which is laid in deep grooves in the slate.

The arm as it passes around the circle cuts out the resistance gradually so that there is no shock felt and a battery current may be regulated with the utmost smoothness and nicety from a fraction of a milliampere up to the full strength of the battery.

The resistance material used in this rheostat is very hard and will last indefinitely without any recoating or repairing of any kind.

Price.....\$10 00



ELECTRO MAGNET.

This instrument is for removing bits of iron or steel from the cornea and chambers of the eye. Every surgeon and Oculist knows from experience how difficult it is to remove particles of iron or steel filings and turnings from the cornea, even after they have been loosened, and the impossibility of extracting them from the posterior chamber of an eye with ordinary instruments. With the aid of this instrument these operations are easy and simple. To use the magnet the conducting cords are connected with the poles of a battery cell (a cell with zinc-carbon element is the best), and the small stylet brought near or in contact with the particle, which adheres to the magnet and is removed. If the particle of iron is imbedded in the cornea, it may be necessary to loosen it and then remove it with the magnet, which can be done without contact with the eye. If iron or steel has penetrated either chamber, it is then necessary to introduce the small stylet of the magnet, which attracts the particle, which is easily removed. The connections are made so that it can be connected to the cell of any Faradic Battery, but its magnetic force is greatly increased by adding several cells. This is the more easily done with our combined battery, as one or more cells can be connected at pleasure

When connected with one of our cells the magnet will lift 300 grains; by adding 6 cells, 720 grains. The instrument is shown full size in the cut. It is

furnished with long and short stylet and conducting cords.



THE MCINTOSH ELECTRO MAGNET.

Complete, with extra stylet and cords, in velvet lined morocco case.

Price.....\$10 00



DR. McINTOSH'S NEW ELECTRIC BULLET PROBE.

This probe is made by twisting two wires together with an insulating substance between them. On one end of the probe the wires bifurcate and connect through the rubber insulating knob, with conducting cords from one galvanic cell. In the other end of the probe the wires are only separated by the insulating substance. To use the probe, connect with one galvanic cell, including a galvanometer in the circuit. When the ends or side of the probe touch any metal so as to complete the galvanic circuit, the galvanometer is instantly deflected.

Price, \$2.00.



ELECTRIC EXPLORING NEEDLE.

The Electric Exploring Needle is as simple as the probe. It consists of a hollow needle, similar to those used with an aspirator. The large end is made to connect with one pole of a battery cell. A small insulated stylet (which fits the needle loosely) connects with the other pole of the cell. A galvanometer is included in the circuit. To use the instrument, connect as above described, and introduce the needle into the part where the ball is supposed to be. If any hard substance impedes its progress, introduce the stylet through the needle. If the points come in contact with any metal substance, the galvanometer is deflected.

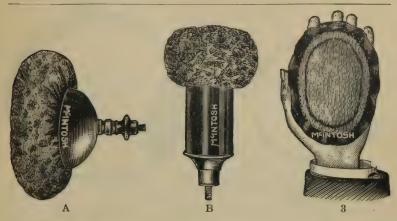
Price, \$2.50.

WE CALL PARTICULAR ATTENTION TO OUR CABLE CONDUCTING CORD AND NEW ADJUSTABLE TIP.





88. DR. McINTOSH'S CARBON DISC ELECTRODE. Price, per pair\$3 00



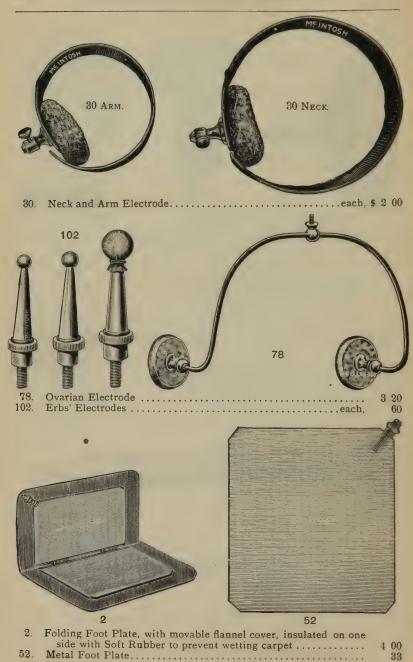




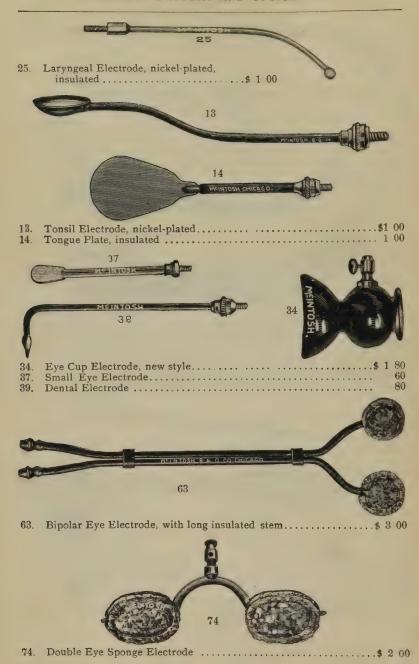
44. Sponge Holder and Current Breaker (handle hard rubber).......\$2 80



- 27. Small Sponge Electrode, for external application to the larynx....\$ 1 20











CESOPHAGEAL ELECTRODE.

For the Treatment of Stricture of the Esophagus and Esophagoplegia.

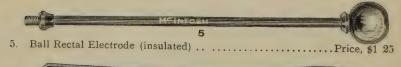
These Electrodes have a spiral inside, are very flexible and insulated with rubber, they are 24 inches in length, and are furnished with four metal olives which screw firmly on the distal end. These olives are 3/8, 1/2, 5/8 and 3/4 inch in diameter. Price of Electrode with set of Olives......\$5 00



89. STOMACH ELECTRODE.

For the Application of Galvanism or Faradism within the Stomach or Rectum.

This is a very flexible Electrode insulated with very smooth imported rubber, the olive point being of hard rubber with perforations, so that the current only comes in contact with the mucous surface through an aqueous medium previously injected. Price.....\$4 00



SERIES LINE

6. Rectal Electrode, nickel-plated....



7. Rectal Electrode, insulated with Polished Hard Rubber.....Price, \$2 00





53. New Style Rectal Electrode, insulated.....



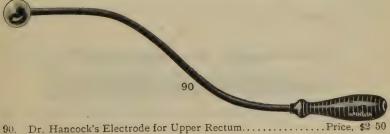
Curved Rectal ElectrodePrice, \$3 00



Syringe Rectal Electrode..........Price, complete, \$5 00

The distal end of this Electrode is intended to be covered with gold beaters' skin, thus permitting the application of heat by warm water or any desired medicament to the mucous membrane, as also of such distention of the organ as may be desirable.

This Electrode is also admirably adapted for vaginal treatment.



90. Dr. Hancock's Electrode for Upper Rectum..



91. Dr. Joseph B. Bacon's Hæmorrhoidal ForcepsPrice, \$10 00



See Index-Dr. Bacon on Treatment of Hæmorrhoids





10. Vaginal Electrode, insulated with polished hard rubber....Price, \$2 50





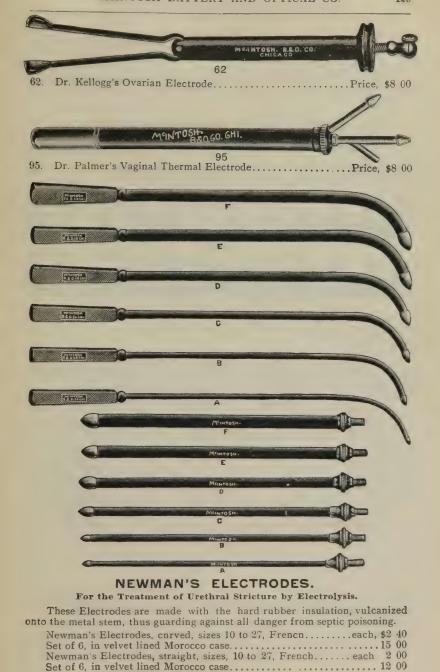


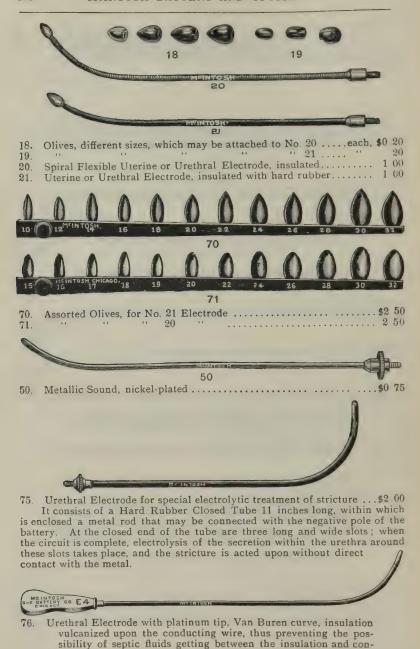
42. Vaginal Electrode for both currents, insulated in the center. . Price, \$4 00



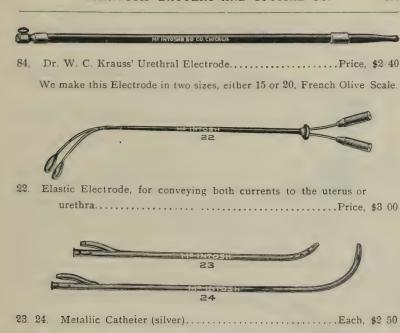
43. Vaginal Electrode for both currents, insulated in halves.....Price, \$4 00

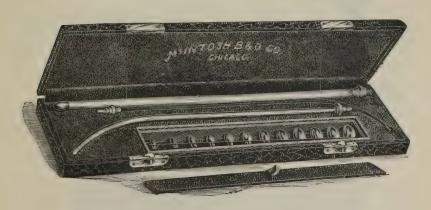






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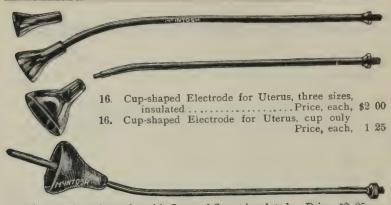




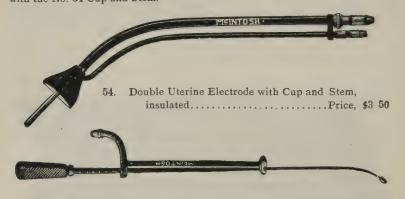
GENITO-URINARY ELECTRODE CASE.

Price.....\$7 00

This case contains metallic sound, flexible and inflexible urethral electrodes, and one dozen olives, numbered from 10 to 32, French scale, all contained in a velvet-lined morocco case, 12 inches long, 3½ inches wide.



NOTE.—The same staff that is used for No. 16 Electrode can be used with the No. 51 Cup and Stem.

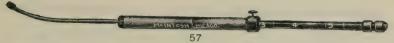




UTERINE DILATOR CASE.

Price \$8 00

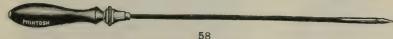
ELECTRODES SPECIALLY RECOMMENDED FOR USE IN GYNECOLOGICAL PRACTICE, BY THE APOSTOLI METHOD.



57. DR. MARTIN'S INTRAUTERINE ELECTRODE.

Platinum Stem.

Price......\$8 00



50

58. DR. MARTIN'S FIBROID NEEDLE.

Platinum Point, Insulated.

Price......\$3 00



98. DR. F. H. MARTIN'S BLOCK TIN INTRA-UTERINE ELECTRODES.

These Electrodes are becoming more and more popular as a cheap and very satisfactory substitute for the more desirable though likewise more costly platinum electrodes.

OPINION OF AN EMINENT PHYSICIAN OF ENG-LAND ON THE VALUE OF APOSTOLI'S TREATMENT.

Thomas Keith, M. D., LL. D., in his paper in the British Medical Journal of Feb'y 14, 1891, On the Treatment of Uterine Tumors by Electricity, says in conclusion: "Dr. Apostoli's treatment is only in its infancy, except, perhaps, in Apostoli's hands, and so at this early stage we can only speak in general terms of its capabilities and powers. In the meantime, I think that it may be said that this treatment almost always relieves pain. It almost always brings about diminution of the tumor—sometimes rapidly. It almost always stops hæmorrhage—sometimes rapidly. The results are almost always permanent and the growth of the tumor, if it be not lessened, is stopped. The general health is immensely improved.

By almost always I mean nineteen cases out of every twenty."



MARTIN'S FLEXIBLE INTRAUTERINE CONCEN-TRATION ELECTRODES.

For treatment of fibroid tumors of the uterus by the "Apostoli" method. Set of four Martin's Concentration Electrodes in Plush-lined Morocco

.....\$20 00 Price of one only, including the muff...... 6 00 Price of Rubber Muff only.....

Martin's Intrauterine Concentration Electrode Case, contains:

1 Flexible Intrauterine Electrode, 3 cm. for 50 ma. 3 cm. for 100 ma. 5 cm. for 50 ma. 5 cm. for 100 ma. 1 Bougie, 3 cm. 5 cm. Shield or Rubber Muff.

Price for the Case complete\$20 00

Note.-When the Martin's Intrauterine Concentration Electrodes require renewal, if the old Electrode with its platinum wrapping is returned to us we will send a new one of same size at \$1.25 net.

These repair charges must invariably accompany the order.



UTERINE ELECTRODE.

In sets of two. Size of stem as follows: Small, 3 and 5 mm.; large, 7 and 10 mm.

Price, per set of two.....\$5 00 Price, either one only ... 3 00

ELECTRICITY

IN

DISEASES OF WOMEN

AND

OBSTETRICS.

(With three chapters summarizing the treatment of general diseases by Electricity.)

BY

FRANKLIN H. MARTIN, M. D.,

PROFESSOR OF GYNECOLOGY, POST-GRADUATE MEDICAL SCHOOL OF CHICAGO; ATT NDING SURGEON WOMAN'S HOSPITAL OF CHICAGO; GYNECOLOGIST TO CHARITY AND POST-GRADUATE HOSPITALS; MEMBER OF CHICAGO GYNECOLOGICAL SOCIETY AND THE AMERICAN GYNECOLOGICAL SOCIETY, ETC.

Dr. Martin has written this work from the standpoint of a text-book, entering into all the infinite details which a student might not be expected to know, and which are of extreme value to practitioners even with a moderate amount of experience in the management of this therapeutic agent. In this direction the book is remarkably satisfactory, and the opening chapters on the principles of electricity and magnetism are valuable. The latter portion of the work, which treats of the application of electricity to the diseases of women and in obstetric cases, is of particular merit, coming from the pen of one who has had great personal experience, and who, moreover, takes a judicial view of the matter, and recognizes clearly many of the limitations of the agent under consideration. Although paying a high tribute to Apostoli, and following somewhat in his footsteps, the author has in many instances improved upon his methods, and, unlike his prototype, is an operating surgeon, with a knowledge of the value of operative procedures when the less heroic treatment of electricity fails to give the desired result, or in cases where it is inapplicable. Perhaps no more temperate modern résumé of the entire subject is available, and it is therefore recommended to students and practitioners with the conviction that it will meet their wants.-Review by Dr. Archibald Church, Chicago Medical Recorder, March. 1893.

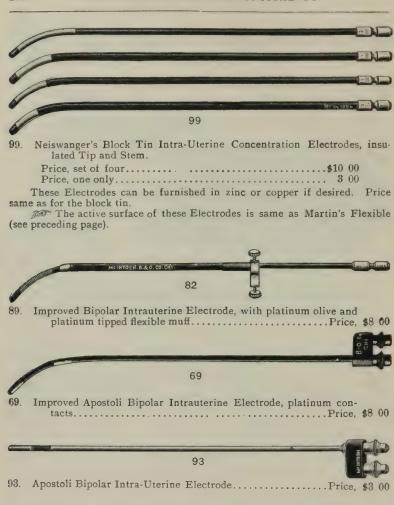
NEW EDITION, WITH NEW CHAPTERS AND ILLUSTRATIONS.

PRICE \$2.00 POSTPAID.

SEND YOUR ORDERS TO

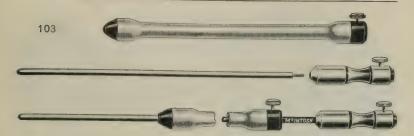
McINTOSH BATTERY AND OPTICAL CO.

521 TO 531 WABASH AVENUE, CHICAGO.



Note.—We make this Electrode in two sizes, either 3 cm. or 5 cm. diameter.

This is an exceedingly desirable addition to the list of fiexible platinum intra-uterine electrodes, and received the endorsement of the American Electro-Therapeutic Association at its 1893 meeting, but is necessarily frail in its construction, and we cannot guarantee against rough usage. The platinum contact is a spiral ribbon of platinum with platinum tip: the bougie is furnished with fenestra to permit escape of gas, thus preventing uterine colic following intra-uterine applications of electricity.



103. ELECTRODES FOR METALLIC ELECTROLYSIS.

Gautier's Method.

The powerful microbicidal properties of oxychloride of copper have long been recognized, but to Gautier is due the credit of demonstrating to the profession the perfect practicability of its application by electrolysis. The sounds used for this purpose are of pure copper, six sounds composing the set, varying from about number six to number sixteen, French scale. A rubber muff for the purpose of insulation accompanies each set, and one E connector, into which the sound is fastened and to which the cord tip is attached.



104

104. STAFF AND OLIVES FOR METALLIC ELECTROLYSIS.

This electrode is designed to be used in the same manner as No. 103 for metallic electrolysis. The olive points are either copper or zinc, and range in size from No. 12 to No. 24 French scale. The hard rubber insulation is vulcanized on the metal stem, thus preventing septic matter from obtaining lodgment between the metal and insulation.

Price, two stems and set of six olives (zinc or copper) \$ 3 00

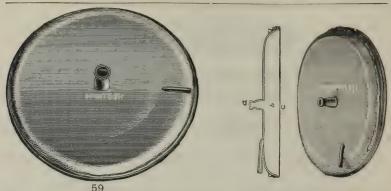
SOME VERY USEFUL CONNECTORS.







66.



59. MARTIN'S MEMBRANE ABDOMINAL ELECTRODE.

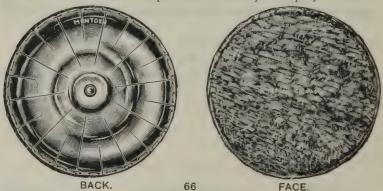
Price\$4 00.

This electrode is a nickel-plated concave plate, 8 inches in diameter, covered with a membrane and holds about one pint of fluid. It is filled at the nozzle on top, as shown in cut. Warm water or medicinal solutions can be used, and the membrane permits contact with the abdominal walls distributing the current evenly over the surface.

NOTE.—At the close of a treatment this electrode should be placed on a folded towel, the water remaining in it, a few grains of Bichloride of mercury being used as an antiseptic; removing the water and allowing the mem-

brane to become dry, very quickly destroys it.

NOTE—We use the best of material and the utmost care in the manufacture of this electrode, but cannot guarantee it against leakage. If the damaged electrode is returned to us we will renew the membrane at a cost of 75c. net. The cost of repairs must invariably accompany the order.

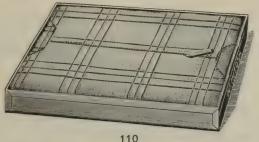


DR. P. S. HAYES' SPONGIO PILINE—ABDOMINAL ELECTRODE.

 Price
 Tinned Copper, \$2 00

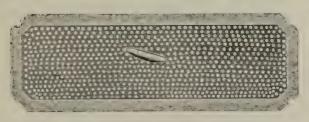
 Price
 Block Tin, 2 50

NOTE.—This Electrode should be thoroughly saturated with water, and placed over the abdomen upon a piece of chamois skin which has been soaked in warm water.



110. APOSTOLI'S CLAY ABDOMINAL ELECTRODE.

Price, complete with tray.....\$3 00.

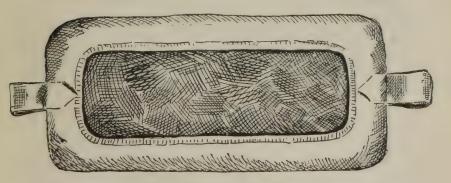


96.

DISPERSIVE ELECTRODES.

Of Flexible Perforated Copper, with covering of Spongio Piline.

Size.	4x6	inches	5	 		 			 	0		 	۰					ь	 	0	.eac	l, \$	1	UU	1
4.6	6x8	4.1		 		 								 							. 44		1	50	,
1.1	7x9																						2	00	۱



109. HEMSTEGER'S "PERFECT" COMPRESS AND POULTICE PROTECTOR.

For description and price see next page.

HEMSTEGER'S "PERFECT" COMPRESS AND POULTICE PROTECTOR.

The Protector is made of rubber, with solid back, and margin on face; the compress or Poultice being placed in the body of the PROTECTOR, and the edges tucked under the margin.

THE CLAIMS FOR AND ADVANTAGES OF THE "PERFECT" COMPRESS AND POULTICE "PROTECTOR" ARE:

It is useful for any kind of poultice or compress.

It will retain the heat and moisture of poultice or compress.

It obviates the frequent changes necessary under the old way, which is attended with danger to the patient.

It prevents the edges from dribbling, getting cold or stiff, and becoming uncomfortable to the patient.

It prevents wetting, staining, and soiling the patient's clothing, and also the bed clothing.

It does away with all extra cloths for covering, which are always heavy and distressing to the patient.

It permits movements of the patient without displacing poultice or compress.

It retains poultice or compress perfectly smooth, and can be quickly adjusted to the patient even under the bed clothing.

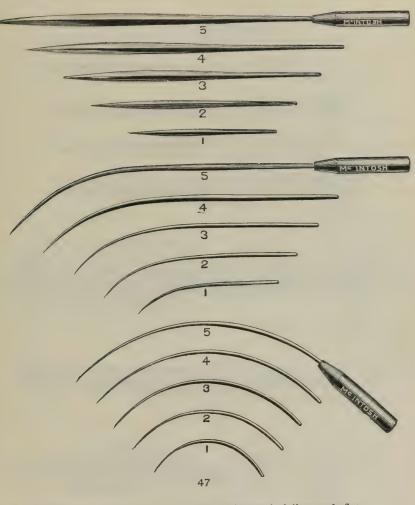
It is light, clean, and comfortable.

The "Poultice Protector" may be used as a protector for the No. 96 Flexible Dispersive Electrodes, and used in this way will be found to be a very desirable "protector" against wetting of the patient.

The Protector at present is made in the following sizes:

No.	1.	Size $5\frac{1}{2} \times 10$ inches, for small to medium surfaces. Price\$	1	00
		Size 10x12 inches, for medium to large surfaces. Price		
		Size 14x18 inches, for very large surfaces. Price		
		Size 6x22 to 26 inches, for spine surface. Price		

NOTE. If the Flexible Dispersive Electrode and the Protector are ordered together the price will be just double the above price for sizes named.

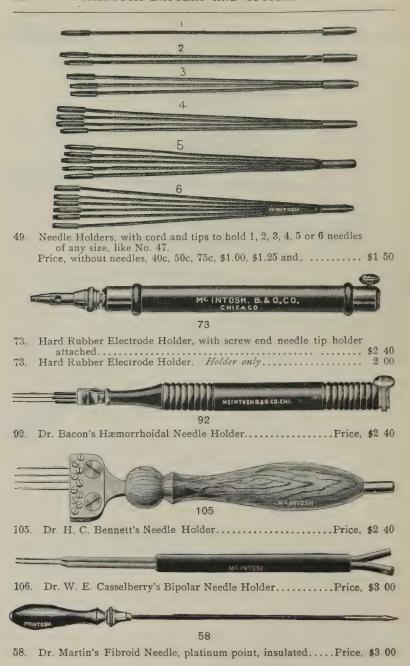


47. Needles for Electrolysis. Straight, half-curved, full-curved, flattened needles (shown in cut full size). Extra heavy triple gold-plated (insulated), price of Nos. 1, 2, 3, 4 and 5, each..........\$ 0 60

PLATINUM NEEDLES. We have platinum needles full sizes shown in above cuts, straight or half-curved.

No.	1,	each	 ۰	0			 ٠	۰										٠		 ٠				۰		 ۰	٠			٠.					 . :	\$ 2	40	0
1.1	2,	11	 									٠			٠	٠		٠			٠	٠	 	٠	٠	 	٠	٠	•	٠.٠	٠	*	۰	1	٠	0	01	0
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8.6	4	6.6					٠					٠			٠					 0	۰	۰	 			 	۰	۰	• •			۰	0	• •		U	U	J

We furnish Needle Tip Holder with each No. 47 Needle without extra charge. Price of Needle Tip Holder only 10c.



MEINTOSH
60
60 Hard Rubber Needle Holder, short
Mº INTOSH
107
107. Hard Rubber Needle Holder, round
The same of the sa
MEINTOSH AZOGO.
61
61. Hard Rubber Needle Holder, with Interrupter
• HTQ5H 0.4.0 C4.
EMEAU.
108
108. Needle Disc, for the removal of "Pigmentary Nævus" or wine
marksPrice, \$5 00
CONTESTATION
72
72. Epilation Forceps
MEINTOSH 114
114. Magnifying GlassPrice, \$0 60
T :
Steel Needles for Removing HairPrice, each, \$0 10 per doz. 1 00
Haves' Bulbous-Pointed Needles " each, 20
Iridio Platinum Needles for Removing Hair " per doz. 2 40 each, 40
Iridio Piatinum recuies for removing ram



Case No. 1 contains an assortment of gold-plated needles, adapted to the various electrolytic operations in which needles are employed.

No. 1. NEEDLE CASE. PRICE, \$6.00,

Case No. 2 is designed expressly for removal of hair, and contains two fine iridio - platinum needles, four steel brooches, insulated handle, epilation forceps, and magnifying glass.



No. 2. NEEDLE CASE. PRICE, \$5.00.

NEISWANGER'S MAGNIFYING GLASS.

Mounted on Head Band.

In the operation for the removal of superfluous hair by electrolysis, a good magnifying glass is an essential requisite, and as it is a matter of great inconvenience to use the ordinary glass (both hands being already employed with needle and forceps) the above has been devised. It is light and convenient and can be used on the head of the operator or patient. Being provided with two "ball and socket" joints it is easily and quickly adjusted and the focal distance being five inches allows of ample working room between the glass and seat of operation.

THE METHODS OF ITS EMPLOYMENT

IN

REMOVING SUPERFLUOUS HAIR

AND

OTHER FACIAL BLEMISHES.

By PLYM S. HAYES, A. M., M. D.

O RECENT achievement in the

the attention of the public and

field of Electrolysis has claimed

physicans as thoroughly as the

removal of superfluous hair

by electrolysis has done.

That it is done, has been

done and can be done.

may be stated with ab-

solute certainty.

That failure from

ignorance and

the scarring of

the face be-

cause of

want

Late Prof. of Chemistry and Toxicology, Woman's Medical College; Prof. of Analytical Chemistry, Chicago College of Pharmacy; Prof. of Gynæcology and Electro-Therapeutics, Chicago Policlinics, etc.

knowledge
and experience has occurred in the
past is no reason
why this truly good
and efficacious method
should be assailed. This
treatise is designed to remove many of the difficulties in the way of physicians
becoming experts in this operation. Notices of this work from
the various medical journals emphasize the fact that it is a work that was

needed and appreciated.

If you have not this work and desire to be known in this field, or desire to perfect yourself in the application of this treatment, do not fail to secure this admirable little monograph.

Sent by Mail, post-paid on receipt of \$1.00.

of **S1.00.**

McINTOSH BATTERY AND OPTICAL CO.

521 TO 531 WABASH AVE.

CHICAGO, ILL.

U. S. A.



GENERAL ELECTRODE CASE NO. 1.

be furnished in case, to order.	
CASE NO, 1 CONTAINS:	
O, Wheel and Interrupting Handle	\$4 00
A. Universal Sponge Holder	1 00
7, Insulated Rectal Electrode	2 00
10, Insulated Vaginal Electrode	2 50
14, Insulated Tongue Plate	1 00
16, Cup-shaped Uterine Electrode	2 00
17, Metallic Brush	75
20, Spiral Flexible U. Electrode	1 00
21, Inflexible U. Electrode	1 00
28, Laryngeal Electrode	1 25
31, Ear Electrode	
34, Eye Cup Electrode	2 00
35, Hair Brush Electrode	2 00
49, Two Needles and two-strand Holders	2 00
Morocco-covered, Velvet-lined Case	5 00

UNIVERSAL CONNECTORS.







C.	Universal Cord Tip Connector, to connect cord tips of any battery	
	with McIntosh Battery	2
TC	Universal Floatrode Connector to connect cord tips of any battery	

J	Universal Electrode Connector, to connector, to connector,	
	with the McIntosh Electrodes	25
D.	Double Connector, for wires or cords	25



GENERAL ELECTRODE CASE NO. 2.

.....\$12 50

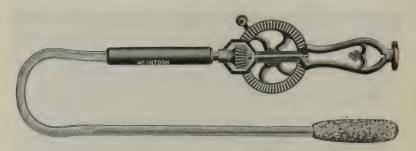
CASE NO. 2 CONTAINS:

A, Universal Sponge Holder\$1	00
6, Small Rectal Electrode	
9, Vaginal Electrode	25
21, Urethral, Insulated 1	00
16, Cup-shaped Uterine Electrode	00
17, Metallic Brush	75
20, Spiral Flexible U. Electrode	00
26, Duchenne's Points, one pair	50
32, Ball Electrode	50
33. Disc Electrode	40
49. One Needle and Holder	15
Morocco-covered, Velvet-lined Case4	00



111. BI-POLAR ROLLER MASSAGE ELECTRODE.

Price.....\$20 00



112. Dr. F. B. Turck's Gyromele (revolving sound)..... Price, \$12 00

"The various cultures are secured from the mucous membrane, by using a revolving sponge introduced into the empty stomach. This instrument is named the gyromele (revolving sound) which for bacteriologic purposes is inclosed in a sheath until it reaches the stomach, to prevent contamination from the mouth and esophagus. Revolutions are produced by an apparatus not unlike a surgical drill, which the sponge in the stomach revolves and removes the adherent material from the mucous membrane for bacteriologic investigations."—Dr. Fenton B. Turck on the Early Diagnosis of Carcinoma of the Stomach, etc.



113. Dr. E. H. McBride's Cataphoric Electrode................Price, \$10 00

Note.—A is the disc made of aluminum and is fastened to a stem or rod of brass, or other suitable metal, which stem passes upward through an opening in the hard rubber handle or casing C and through nut D, and projects an inch above the rubber casing with an opening in the upper end to receive the tip of an ordinary cord used in batteries.

In using the electrode, cut a thin layer of tissue paper or lint, to fit the chamber and put it in place, then with a glass dropper place a few drops of the medicine on the lint or paper, so that when the current is turned on (the hard rubber rim acting as insulator) it will be obliged to pass only through the central or medicated moist portions, thereby giving the most favorable cataphoresis that can possibly be obtained.

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90	D1. 2130110, 2				



ALUMINIUM HEAD LAMP.

Patented February 14th, 1893.

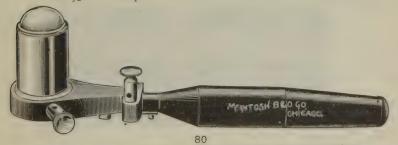
Pr	ice, comp	olete,	including	Reflector,	four-	candle	power	Incand	lescen	t	
	Lamp,	Lense	Head-Bai	nd and Fle	xible	Cord			Net.	\$20	00
E	tra Lam	os, eac	h						. Net.	1	20

This Illuminator is made almost entirely of aluminium, and is so extremely light that its weight is scarcely perceptible on the head, the whole apparatus complete weighing but three and one-quarter ounces. The thin German silver plate to which is sewed the head-band is connected to the hyperbolic reflector by a universal joint, enabling the operator to change the position at will, either higher, lower or to either side, and again from any of these positions to direct the rays at any angle. The lamp proper is supported inside the reflector by another universal joint, allowing of the focusing of the light and rendering the removal of the lamp extremely simple. This substitution of one lamp for another (which can be accomplished in a minute and with ease) is an important point, as all lamps will need renewal sooner or later, and then it is troublesome to be compelled to send the entire apparatus to the maker to have the lamp replaced. By keeping a few lamps on hand you can change them at a moment's notice, put a new lamp into our apparatus and lose no time.

The front of this head lamp consists of a disc of glass, in the center of which is the lense which throws a strong and concentrated light on the point of operation. The edges of the disc are ground glass, so that a diffused light is shed upon the surface immediately surrounding the point most brilliantly illuminated, instead of its being in total darkness. A light, flexible cord runs back over the ear to a storage battery near by.

This apparatus will be found extremely useful by surgeons in operating on the eye, ear and throat, and internal cavities of the body.







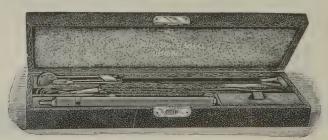


McINTOSH ELECTRIC LARYNGOSCOPE AND RHEOSTAT.

The above cut shows the Laryngoscope about one-half size. This is the lightest, neatest and most convenient instrument yet brought out. The hard-rubber handle is vulcanized on the metal conductors, thus making the rubber and metal virtually one solid piece. It can be used with or without the mirror: or both incandescent lamp and mirror can be removed and eloctrolytic needles, small cautery electrode, or tooth-dryer, used in the handle. The current breaker allows the operator to control the light at will. With the Rheostat in circuit with the lamp, a current from two to four cells can be so perfectly controlled that all danger of burning out the lamp is avoided.

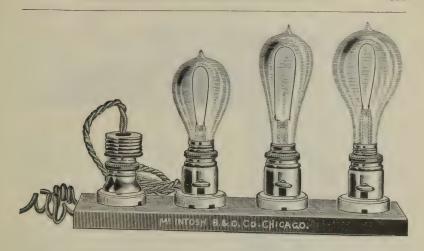


The Rheostat is about one-half inch in diameter, six inches long when closed eight inches long when drawn out full length. To use it, place in circuit with the Laryngoscope and draw out to its full length (this throws all the resistance into the circuit). Press the contact on the Laryngoscope handle, then gradually press in the Rheostat until the small incandescent lamp gives a white light. Care must be used not to go beyond this point, as a small increase in the current will destroy the lamp.



Price of Laryngoscope, Conducting Cords and Rheostat, in a		
neat Morocco Case Net,	\$10	00
Price of Laryngoscope only Net,	8	00
Price of ½ Candle Power Incandescent Lamp only Net,	1	50
Price of Laryngoscope Cords onlyNet,		80
Price of Laryngoscope Rheostat onlyNet,	1	60

The Electric Laryngoscope can be used on three or four cells of our Combined Battery, or on any Battery of equivalent Electro-motive force.



CHARGING SWITCH No. 3; for 3 lamps. The above cut shows the board with 16-32 and 50 C. P. lamps in position; as arranged above the current delivered to the storage battery would be about 2 $\frac{2}{10}$ amperes.

CHARGING SWITCH, for charging storage batteries from the Edison Incandescent current

No. 1.	Plugs for	1 lamp and	d cord	 	. Net,	\$4 20
No. 2.	Plugs for	2 lamps as	nd cord	 	Net,	5 40
27 0	70.1	0.1	9 9	 	9.9	0 00

No. 3. Plugs for 3 lamps and cord (as in above cut). Net, 6 00

Lamps for above not furnished except on special order, and at prices named below.

The charging capacity when using the above charging switch-boards is as follows:

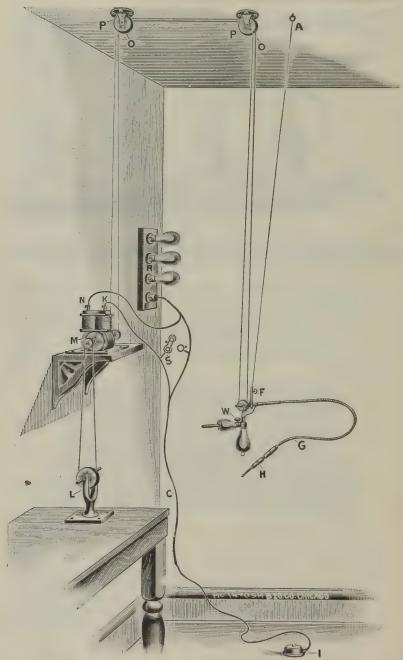
16	C. P.	lamp	will	charge	less than 1/2 ampere
24	4.6	11	4.6	11	about $\frac{6}{10}$ ampere.
32	6.6	4.6	4.6	6.1	" $\frac{7}{10}$ ampere.
50	6.6	4.6	8.6	1.6	1 ampere.
100	1.1	6.6	4 (1.4	3 ampere.

Price of Electric Lamps, 110 volt:

75
90
50
60

Price of low voltage Electric Lamps (3 to 8 volt):

1/2	C. P., :	for	Elec	tric	Laryng	oscope	or Post	Nasal	Illumi-	
,-	nator.								Net, \$1	50
1									Net, 1	
2	C. P								Net, 1	00
									Net, 1	



ELECTRIC SUSPENSION DENTAL AND SURGICAL ENGINE.

Of all forms of Dental and Surgical Engines none have met every requirement of work as well as those made on the suspension principal. The main points gained by this principle of construction, are mobility of wide range; steadiness of motion; high speed without noise or vibration; and perfect flexibility. Those familiar with the different forms of engines will see from the cut and description that the above claims are fully met.

DESCRIPTION.

From the pulley on the electric motor M a belt is carried up and over the double pulley P and to another double pulley P and down to the pulley on the suspension engine head W. Prom a point A a wire is carried down to F and held in place by a thumb screw. This wire serves three purposes; to increase or diminish the tension on the belt, to take off the constant strain of the weight and pulley, keep the revolving shaft in one direction and prevent the belt from twisting. Without this wire the tension on the belt would be so great the engine would run hard and the belt be constantly breaking. The pulley head is so made that the S. S. White flexible cable and hand piece can be connected with it as shown in cut. The double pulleys have oil spaces O, filled with a packing saturated with oil. With this arrangement they do not need oiling oftener than once in ten days.

The Motor M as shown in the cut can be placed on a bracket in the laboratory and the belt carried into the operating room, any distance, from 18 inches to 25 or 30 feet, to run the Dental Engine, pulley W. The Electric Motor M, as shown in the cut, is connected at N and K with an incandescent electric light circuit (of 110 volts) which is carried through a bank of three incandescent lamps R for increasing or lessening the resistance in the circuit. By passing the current through the lower lamp slow speed is obtained, by adding the middle lamp medium speed is given, and full speed by adding the upper lamp. If a wire rheostat is desired in place of the bank of lamps it can be furnished. The Double conducting cord C is connected with a push button which is operated with the foot. This enables the operator to start or stop the motor at will. As shown in the cut a belt can be connected with pulley on the motor M and carried down to a dental lathe in the laboratory. By the aid of the switch S, near the lathe, electricity can be turned on or off the motor to run the lathe, without passing through the cord and foot push button. If it is desired a belt can be run from the motor to a pulley on a counter shaft, and from a large pulley on the counter shaft to a pump for compressing air. When connection with an incandescent electric light circuit cannot be had a motor can be connected with storage batteries and operated as described above.

PRICE OF ELECTRICAL SUSPENSION DENTAL AND SURGICAL ENGINE AND ACCESSORIES.

Please observe that these prices are strictly net.

1-1/8 H. P. Reversible Incandescent Electric Motor\$24 ())
1-Suspension Dental Engine, head with S. S. White flexible cable and	
hand piece 30 00)
1—Switch 1 00	0
1—Bank of three Incandescent Lamps 8 00	
10 ft. double conducting cord and foot push button 2 00)
Cost for complete outfit \$65 00	5
Suspension Dental Engine and 2 pulleys, without cable and hand piece " 15 00	0



BURRS, DRILLS, TREPHINES AND SAWS.

Nasal Burrs, Nos. 1 to 12each	\$1 50
" Trephines, Nos. 13 to 16 "	1 50
Guards for Nasal Burrs	2 75
" " Trephines	2 75
Dr. Myles' Guarded Trephine, with shoulder, No. 17	4 50
Dr Goodwillie's Guarded Nasal Drill, No. 18	6 00
Burr Drill No. 19	5.50
" Knife Drill No. 20	4 50
Dr. Haskell's Dental Burner	75

PLEASE OBSERVE THAT THE PRICES OF ALL THE DENTAL ACCESSORIES ARE STRICTLY NET.

ELECTRICITY AS A THERAPEUTIC AGENT IN THE TREATMENT OF HYPERÆMIA AND CONGESTION OF THE PULP AND PERIDENTAL MEMBRANE.

BY JOHN S. MARSHALL, M. D.,

(Read before the American Dental Association, Saratoga Springs, N. Y., August 7, 1891, and reprinted from the Dental Cosmos for November, 1891.)

Electro-therapeutics in medicine and surgery has been developed to a considerable degree, and may be said to form a very large and important element in the treatment of certain forms of disease, while in dental surgery it has received but little attention; in fact, it is almost a negative quantity in dental literature.

Its application, however, in dental surgery does not offer so broad a field for investigation, yet a study of its value as a remedial agent will be no less interesting than in other special departments of medicine, and when better understood it will, I believe, become an important adjunct to the means already at our command for the treatment of a considerable number of dental and oral diseases.

I have chosen as the special topic of this paper two out of several important pathological conditions of the teeth to which the various forms of treatment by electricity may be beneficially applied. The choice has been governed by a desire to present forms of disease upon which these beneficial results could be most easily and certainly demonstrated.

An exhaustive treatment of the subject at this time and place will be out of the question. I shall therefore refrain from generalities and place my subject before you in outline only, leaving your good sense and experience with disease to fill in the details.

Hyperæmia and congestion of the dental pulp from caries, thermal shock, chemical and mechanical irritants, and traumatic injuries, etc., resulting in odontalgia, are among the most common of the diseased conditions found in the oral cavity, and many times the most difficult to control by the methods of treatment usually adopted, without devitalization of the pulp. Hyperæmia and congestion of the peridental membrane from constitutional causes, such as rheumatism, gout and pregnancy, and certain local causes, like excessive malleting, undue wedging, change of position of the teeth in regulating, and other surgical or traumatic injuries, resulting in severe pain, is many times quite as difficult to control.

These forms of disease will best serve our purpose in this attempt to demonstrate the therapeutic value of electric and galvanic currents in the treatment of local disorders of the oral cavity.

The object, of course, in the treatment of these forms of disease is, in the first class, to relieve the congested condition of the blood vessels and to preserve the vitality of the pulp: in the other, to arrest the inflammatory symptoms short of the suppurative process or of the formation of adventitious tissue or new growths.

How these much-to-be-desired conditions can be obtained is a question that has often troubled the mind of the thoughtful dentist; and while I do not claim to have made any new discovery, I am confident that the galvanic current, if judiciously used, will prove to be a valuable aid in the treatment of certain forms of inflammation of the pulp and peridental membrane, and many other conditions which further experience and experiment will demonstrate.

It is a generally known fact to medical electricians that local hyperæmia and anæmia can be produced at will by the influence of the negative and positive currents of electricity, and that resorption of certain inflammatory products and new growths can be promoted through their stimulating effect upon the absorbent organs.

It was the knowledge of these facts which led me to investigate the value of the application of these principles to the treatment of congested conditions of the dental pulp and peridental membrane.

The first case upon which I attempted to demonstrate these principles (which will serve as a good illustration) was a tooth in my own mouth, the history of which is as follows: The right first superior bicuspid had been filled with gold at the age of twenty years, but from poor manipulation had been refilled several times during the next fourteen years. Ten years ago the last of these fillings came out, leaving a large disto-approximal cavity, and the pulp nearly exposed. The tooth was exceedingly sensitive to the slightest thermal changes, to acids or sweets: it was therefore plugged with Hill's stopping.

Six years ago this filling was removed with the hope of introducing gold, but the tooth was in such a sensitive condition as to make it unwise to introduce a gold plug; oxyphosphate cement was therefore substituted. During the following night there were developed marked evidences of a congested condition of the pulp. The next morning the phosphate filling was removed and the cavity dressed with oil of cloves, and a solution of gutta-percha in chloroform was flowed over the bottom of the cavity, which was refilled with oxyphosphate cement. The symptoms, however, did not abate, but gradually increased in severity. I therefore determined to try the depleting effect of the positive galvanic current, and called upon my friend, Dr. Justin Haves, of Chicago, with the request that this line of treatment might be thoroughly tried. The positive pole of the continuous galvanic current was applied to the tooth, and the negative pole to the carotid triangle of the neck on the same side. The strength of the current was graduated to my ability to bear it without discomfort, and the poles were allowed to remain in position for about half an hour. At the end of ten minutes there was a marked improvement in the symptoms, and at the end of the half-hour all discomfort in the tooth had disappeared. During the following night the tooth again became uneasy, but a second treatment of about twenty minutes the next morning completely relieved it, and from that time on it has caused me no annoyance. Three years ago the tooth was filled with gold, at a clinic by Dr. Roscoe F. Ludwig, at the International Medical Congress held at Washington, D. C. The pulp is still vital, but is no more susceptible to irritating influences than that of any other tooth in my

The marked success which followed the treatment of this tooth has led me to adopt the same treatment in several similar cases, all but one of which have responded to my entire satisfaction. This case was one in which there was not much hope of the treatment proving successful, yet it was tried as a for-

lorn hope. The history is briefly as follows: Miss J. E., aged twenty, of frail, delicate organization, fair health, had been under treatment one year previously for protrusion of the superior anterior teeth. The operation had been performed slowly and with great care to avoid serious irritation of the dental tissues and alveolar processes, and the final retaining plates had been worn for about six months. About this time a slight discoloration near the gum of the right superior central was discovered. She came in great haste to know why this should occur. There had been no pain in the tooth, and there was no soreness to percussion; it was slightly sensitive to heat and cold, but this symptom was not so marked as in the adjoining teeth. My diagnosis was either passive congestion of the pulp, induced by the irritation in moving the teeth, or the formation of an embolus in the pulp vessels. Which it was, I was unable to decide, and as there seemed to be no hope of saving the vitality of the pulp by the ordinary methods of treatment, the positive galvanic current was applied. In the treatment of this case I called in council, Dr. Plymon Hayes, of Chicago. On the application of the current to the neighboring teeth, threefourths of a milliampere was all that could be comfortable borne, while the diseased tooth would bear just double this amount. Daily treatments of twenty minutes each were maintained for a week; during the first three days there was a slight increase in the sensation of the tooth under the current, and the strength was reduced to one milliampere; after this, however, sensation seemed to grow gradually less, the current being increased to three milliamperes without unpleasent response. The treatment was therefore abandoned, the tooth tapped, and the pulp removed, and the case treated by the usual methods.

In the treatment of pericementitis not caused by septic poisoning from a devitalized pulp, it is many times of very great benefit. In these cases the positive pole should be applied to the gum over the roots of the affected tooth; marked relief is often experienced in a few minutes, and often entire relief after three or four applications.

In a former paper* I have called attention to the prevalence of hyperæmic odontalgia frequently accompanying pregnancy, as a result of impeded circulation in the lower extremities and thereby causing general hyperæmia of the upper half of the body. The general treatment suggested in that class of cases was rest in the recumbent position, and anodynes. I would now suggest as an additional treatment the local application of the positive galvanic current to the affected teeth.

With regard to the strength of the current, experience proves that from three-fourths to one and a half milliamperes is sufficient in the class of cases so far mentioned, while the frequency of the sittings will depend upon the severity of the local symptoms and the nervous susceptibility of the individual.

As a rule, one treatment in twenty-four hours is all that will be required; in aggravated cases two, and occasionally three, may be advisable, the duration of the sittings being from fifteen to thirty minutes.

As a means of diagnosis in obscure cases of the vitality or nonvitality of the dental pulp, I know of nothing so sure to demonstrate to a positive certainty these conditions as the electrical currents, both the galvanic and the faradic. In the more obscure cases, however, the faradic is superior to the galvanic, for if there is the slightest vitality remaining in the pulp it will demonstrate it instantly by causing a response in the tooth. It is superior in this respect to the

^{*}Journal American Medical Association, 1889.

transmission of light by the electric mouth lamp, for many times when the condition is upon the border line between the life and death of the pulp, the electric light fails to satisfactorily demonstrate the condition.

I also believe that the electric currents will serve to demonstrate the presence of low grades of inflammation of the tooth-pulp, so often the cause of various forms of neuralgic conditions of the face and head. The faradic current especially, if applied in such cases, will demonstrate a hypersensitive condition of the tooth-pulp. In order to locate the tooth causing the neuralgia, it will be necessary to apply the current to each individual tooth. The diseased one will give more active response to the current than will the healthy teeth; in other words, the diseased tooth will not bear so strong a current as will the healthy ones, hence the importance of using the milliamperemeter for measuring the exact strength of the current.

The value of the current in the treatment of neuralgia, paralysis, atrophy of muscles, chronic indurations, tumors, and various other conditions there is not time to detail. We shall therefore leave the matter here, feeling that we have offered a sufficient number of suggestions to stimulate investigation as to the value of electro-therapeutic treatment in the class of cases which have formed the especial topic of this paper.

The battery, milliamperemeter, and the electrode which I use were made for me by the McIntosh Battery and Optical Company, of Chicago.



THE GEM DENTAL BATTERY.

(Size of Case, 5x7x23/4 inches.)

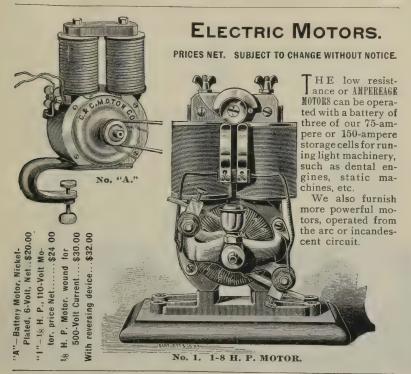
Price, with Grenet cell. Conducting Cords, Electrodes and
Forceps Connector.....net \$13 60
Price, without Grenet Cell....net \$12 00

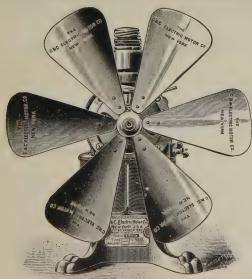
The constant call for a Faradic Battery for Dentists' use induced us to make and place the above on our list. The coil is made in the same style and finish as the coil on our No. 3 Physician's Battery. It is on a hard rubber base; the metal-work is finely nickel-plated. It is put up in a neat Morocco case, lined with crimson or purple velvet. The contrast of the polished black-rubber and nickel-plated work with the velvet-lined case, gives a very fine and attractive appearance. This Battery is also very neat and convenient for general use in the physician's office.

29. DENTAL FORCEPS CONNECTOR.

Price..... \$0 40

For connecting conducting cords of battery to the Dental Forceps.





1-8 H. P. MOTOR WITH FAN.

FAN OUTFITS.

PRICES NET.

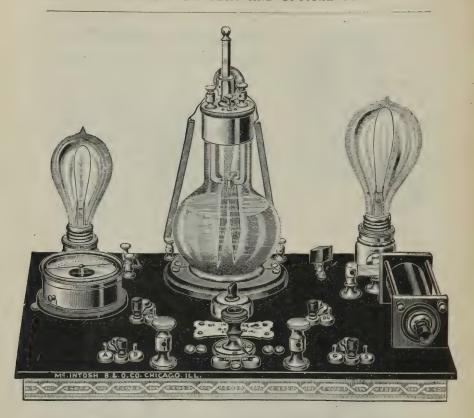
1/8 H. P. Motor, including 12-in. Fan, \$27 00

¼ H. P. Motor, including 18-in. Fan, 105 00

1/8 H. P. Motor with Fan, for use on 52voltalternating cur-

rent......Price, 20 00

IN ordering, state whether Motor is for Arc or Incandescent circuits. If for an Arc circuit, state current in Amperes and give Voltage; if an Incandescent, state potential in volts.



THE MCINTOSH COMPLETE SWITCH BOARD.

For Use on 110-Volt Lighting Circuit.

Price, as shown in cut.....\$ 80 00 Price, as shown in cut, and including glass protecting case, 100 00

The Electric Light Current Switch board is to be attached to any 110 volt direct current to give the full range of galvanism or faradism for therapeutic purposes.

The terminal where the current enters the plate will be marked "P" (positive), the other will be marked "N" (negative).

As it is imperative that the terminal marked "P" should be attached to the positive end of the wire from the electric light current, it becomes necessary to test the circuit for polarity, which is easiest done in the following manner: Screw the plug into the socket from which it is desired to use the switch board and turn on the current by means of the key in the socket or otherwise; after the current has been turned on care must be taken not to let the bare ends of the twisted conducting wires come together, as it would burn out the fuse in the plug). Now take a small strip of white paper and dip into a solution of potassium iodide (any strength), bring the ends of the twisted conducting wires in contact with the paper (about one inch apart) when there will be a deep brown iodine stain under the positive wireAs this will always be the positive wire from this socket it would be well to mark it by a knot, or otherwise; but should the current be taken from any other socket, the polarity must be again tested.

The Accessories on the Plate. The ten or sixteen c. p. lamp is screwed into the socket at the left of the board, the $50 \, \mathrm{c.}$ p. lamp at the right.

The round switch with key on top situated near the center of plate is the "cut out," and turns the current off and on. N. B. Always turn key to the

The plug to the left of the 50 c. p. lamp is also a "cut out." If this is taken out each time and carried in the pocket, it will not be possible for others to use the battery unless they have a plug.

The two binding posts to the right of the small lamp hold the safety fuse which should not carry more than a half ampere (500 milliamperes) of current. N. B. See that this is always intact as no current can pass if it is broken.

The 2-button switch to the right of the meter is for throwing the rheostat

in or out of the circuit.

The 2-button switch just to the left of the coil is for operating the coil

The 3-button switch marked "A," "OFF," "B" on the lower left is for

operating the milliampere meter.

The 4-button switch marked "G. P. S" on the lower right is for selecting the kind of current. "G" for galvanic, "P" for primary or mild faradic, and "S" for secondary faradic current.

The "Pole Changer" is situated in front between the two binding posts.

To Use the Rheostat. Fill the glass jar with ordinary water up to within about one-half inch of the point of the middle platinum plate when it is

raised to its highest point.

When the rheostat switch lever is on the "off" button the current does not pass through the instrument, but if we place it on the "on" button the current must then pass through the rheostat, and the deeper the platinum plate is immersed in the water the more current will pass through the patient, and consequently the more the milliampere meter will register; by raising or lowering the plate in the water the current can be increased or diminished in the most gradual gradation.

N. B. If the resistance of the water in the rheostat is found to be too

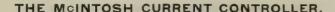
great, add a few grains of sodium bicarb.

To Use the Milliamperemeter. Set the needle free by means of the sliding button on the side of the instrument, then turn the meter so that when the needle is at rest each end will point to "0." When the milliampere switch lever is on button "A," we read the graduation on the long scale of the meter, or from 0 to 1,000; when the switch lever is on button "B," we read the graduation on the short scale of the meter, or from 0 to 20. When the switch lever is on the "off" button, the meter is not in the circuit.

To Use the Galvanic Current. Put the Faradic switch on the "off" button, and the current selector on "G." When the 50 c. p. lamp is turned off, we have the full 110 volts at the binding posts, but when the 50 c. p. lamp is turned on the pressure at the binding posts drops to 30 volts, either of which can be controlled by the rheostat and measured by the meter as per directions given above.

To Use the Faradic Current. Turn on the 50 c. p. lamp, put the Faradic switch on the "on" button, and the rheotome spring will commence to vibrate, making a humming sound; put the current selector on "P" if a primary or mild current is wanted, and on "S" if a secondary or stronger current. Either current can be increased by pulling out the shield. N. B. The rheostat will also control either the primary or secondary Faradic currents.

To Use the Pole Changer. When the indicator on the Pole Changer points to the right, the right hand binding post is positive and the left hand binding post is negative; when the indicator is turned to the left, the left hand binding post becomes positive, and the right hand binding post negative.



The only absolutely safe device by which the physician may utilize the 110-volt dynamo current for therapeutic work—electrolytic work.

The only absolutely safe device by which the physician can utilize the 52-volt alternating dynamo current for therapeutic work—the true sinusoidal current.



Price, Current Controller, with cord and plug, only....Net, \$50 00
McIntosh Milliampere Meter, extra......Net, 20 00
Jewell Milliampere Meter, extra......Net, 48 00

It is our aim always to be fully abreast with the times in furnishing our patrons electro-therapeutic apparatus of the latest approved patterns and highest efficiency. The present tendency in electro-therapeutics is decidedly in the direction of greater simplicity and uniformity in the apparatus employed. Sources of supply of electric force, such as are used for commercial purposes, derived from dynamos, storage batteries, etc., are a material help to physicians in conforming to this tendency.

The constant current generated by a dynamo or storage battery differs in action in no essential particular from the constant or galvanic current produced by chemical action in some one or other of the many forms of galvanic cells customarily used by physicians, while the electro-motive force is as a rule, much less variable. The advantage to the physician of having a current supply from a central station and thereby freeing him from the innumerable annoyances inseparable from the attempt to keep a series of primary batteries in efficient working condition, can be readily seen and appreciated by all who have worked in this field. If, then, incandescent light currents or dynamo currents used for propelling street cars or running other motors were accessible to all physicians, it has occurred to many that electro-therapeutic

apparatus might be greatly simplified, for then provision for controlling the current and adapting it to the physician's work would alone be needed. But up to this time, two formidable obstacles have interfered to prevent the general use of these currents as the supply of electro-motive force for therapeutics All dynamos do not furnish a current that is of the nature of a galvanic current. Many of the incandescent light dynamos generate "to and fro" or alternating currents and such currents, while they have physiological and therapeutical effects peculiar to themselves and are very useful in the treatment of many ailments, do not do the work of the constant or galvanic current, such as electrolysis, or cataphoresis. Again, many physicians who would gladly avail themselves of electro-therapeutic helps are located out of range of all commercial currents, and must, if they use electricity at all, depend upon chemical sources of generation for galvanic currents, such as bichromate of potash, chloride of ammonium, or some other form of primary battery. This state of affairs would seem at first glance to raise an insurmountable barrier against the many demands now being made to reduce therapeutic work to a more simple and uniform basis. But, on the contrary, it has only served to render such efforts more comprehensive in their scope and has provoked research that has had for its object to modify and control electric force, from whatever source, by a simple piece of apparatus readily understood and easily arranged by any physician, surgeon, or dentist, whether his knowledge of the physics of electricity be great or little.

THE MCINTOSH CURRENT CONTROLLER

Is an instrument possessed of a very wide range of application. It is constructed so as to increase or decrease the voltage, or electro-motive force in a decimal ratio by a simple sliding motion along a clearly marked scale. It can be attached to the wires conveying the current from any incandescent light dynamo, alternating or direct, or can be put in circuit with equal facility with a current derived from a storage or primary battery plant, and will act in the same manner under all these circumstances. The original voltage from any one of these sources being known, the pressure employed at any instant can be readily determined. The arrangement of the apparatus is such that the patient undergoing treatment is in no danger whatever of accident from an excessive current. Aside from its adaptation to continuous and alternating currents derived from any source, the apparatus is small and compact, and constructed in the most durable manner. It requires but few simple directions for managing it, and is always ready for instant use when needed. It can also be readily transported from place to place, and then attached to an electric circuit of suitable voltage either through a lamp socket or other connector wherever such circuit has been established. This furnishes the profession with an instrument uniform in action, of wide range of adaptability, the construction and management of which it is easy to master, and which enables those using it to compare results, no matter what their field of practice, or how widely separated they may be in location. The introduction of an apparatus possessing such capacities and advantages marks an epoch in the progress of the science of electro-therapy, and we confidently expect for it a wide patronage.

THE ALTERNATING DYNAMO CURRENTS IN THERA. PEUTICS.

The alternating dynamo current such as is employed in the Thomson-Houston and Westinghouse systems of incandescent lighting, have physiological effects upon animal organism peculiar to themselves. The current, which upon the main is of high voltage, is transformed or converted at the point where it is to be utilized in the separate buildings to be lighted, so that the house circuit has an electro-motive force of about fifty volts. This house circuit can, by suitable devices, such as the "McIntosh Current Controller" be readily applied to the body, and its physiological or therapeutic effects utilized. Being an alternating current, it changes its polarity many times a second, so that none of the effects dependent upon constant polar action, can be produced by it—such as Electrolysis or Cataphoresis. It is not therefore of service in directly destroying tumors, or abnormal growths, nor can it be employed to remove nævi, birthmarks, facial blemishes and the like. It is not useful as a hæmostatic, nor will it relieve stricture or stenosed canals.

It is not directly helpful in removing abnormal deposits and inflammatory or serous exudates from tissue structure and cavities where their presence impedes healthful action. But while it can do none of these things, the alternating current generated by this kind of dynamo has powerful vaso-motor effects. It causes gentle but powerful stimulation to muscular tissue of both the striped and unstriped variety; it quickens nutrition; excites secretion and arouses latent physiological function.

Under its influence a marked increase in the elimination of carbonic acid and urea takes place. It is therefore, a most appropriate method of treatment for disordered constitutional conditions, such as gout, rheumatism, obesity and the like. Deranged states of the skin, such as eczema and acne, have shown marked improvement under its influence; while states of nervous depression of the type of neurasthenia, experience more relief from this form of stimulation than from either the continuous current, or the interrupted induced currents.

Another peculiarity of the alternating current, is its very soothing effect upon the sensory nerves. Although it is much less disagreeable than the currents generated by the ordinary induction apparatus used by physicians, it is serviceable in allaying pain of a neuralgic or rheumatic character. This effect may be the result of the marked alterations in nutrition which it brings about.

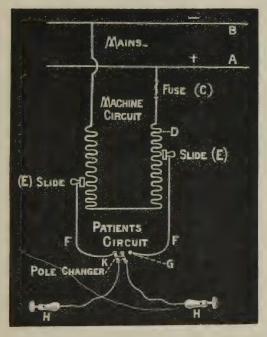
While currents of this nature cannot supply the place of continuous of galvanic currents, or do the work peculiar to them, yet what is already known concerning the physiological effects of alternating currents, show them to possess a quality peculiar to themselves, and adapted to a wide range of therapeutic applications

The McIntosh Current Controller is an absolutely safe means of adapting either the 110-volt constant dynamo current or the 52-volt alternating dynamo current to therapeutic use. The physicians who are using this device are delighted with its adaptability and efficiency.

Reprinted from the Bulletin of the Electro-Therapeutical Laboratory of the University of Michigan, April, 1894.

THE McINTOSH CURRENT CONTROLLER.

This controller is designed for portability, though not at the expense of durability. It is contained in a neat hardwood case $6\frac{1}{2}$ in. by 9 in. by 4 in., having the index and regulating handles on the top, the binding posts for the machine terminals on one end and the reverser and binding posts for patients circuit on the other end. A handle is fastened to the side for convenience in carrying. A delicate fuse is constantly in the machine circuit, so placed that all the current traverses the fuse before it reaches the point where the patients circuit joins the machine circuit. This avoids all possibility of a



dangerous increase in the current strength in the patients circuit.

The fuse is so adjusted that a current of over one-half an ampere in the machine circuit would instantly melt it and thus disconnect the instrument entirely from the dynamo. Under no circumstances can a harmful current pass through the patient. The reverser is in the patients circuit to avoid the sparking and burning of contacts that would result from reversing the heavier current carried by the machine circuit. The controller works on the well-known "shunt" principle. The machine circuit consists of a suc-

cession of coils, 19 in all, joined in series and having a united resistance of 209 ohms about the resistance of an ordinary 100-volt lamp. The patients circuit is so arranged with sliding contacts that the patient may be placed in a shunt to one or more coils. The coils vary in size, but are so proportioned as to modify the current in tenths and hundredths. The sliding contacts are arranged in two rows, each row having its own index. The row on the left is connected with the larger coils, and consequently each coil in this row divides the E. M. F. in the machine circuit by ten. The right hand row is connected with the smaller coils, and each coil divides the E. M. F. by one hundred. The two rows may be used singly or together. The contact consists of a heavy brass roller sliding on a flat brass plate and held tightly in contact with the plate by a flat brass spring. The following diagram illustrates the essential

parts of the instrument, and will enable the reader to clearly understand its construction and action. The laboratory test was made with an E M. F. of 90 volts in the patients circuit when shunt to the entire number of coils. A resistance of 1,560 ohms was placed in the patients circuit, in which was included also a Weston milliampere meter. A Weston volt meter was connected shunt to the patients terminals. The following table will show the E. M. F and current in patients circuit, with the sliding contact at various points on the index:

LEFT SLIDE.		RIGHT SLIDE	ē.		
INDEX.	E. M. F.	CURRENT.	INDEX.	E. M. F.	CURRENT.
1	8 Volts	7 Milliamperes 15 25 32 40 49 58 67	1	1.1 Volts 2.3 " 3.51 " 4.24 " 5.35 " 6.93 " 8.21 "	9 Mit'mperes 2 3 3.61 4.5 5.84 6 9 7.8
)	90 "	75 "	10	11.89 "	8.93 "

It will be seen from these tables that the voltage and current increase and diminish in corresponding ratio, and this of course holds true no matter what the source of E. M. F., whether from a constant current dynamo, an alternating current dynamo, or a series of primary batteries. It appears, therefore, from these observations that we have in this controller a simple and efficient mechanical device for adapting both constant and alternating currents, or currents derived from primary batteries to the physicians use.

We take pleasure in reprinting from the bulletin of the Electro-Therapeutical Laboratory of the University of Michigan, the views of Prof. W. J. Herdman, M. D., on what he correctly calls

A CONVENIENT OUTFIT.

Simple, efficient and time-saving apparatus is what commends itself to the busy physician. When he is once convinced that electricity will be of service to him in his practice, the next consideration is to have that servant neat, orderly, well trained, and prompt to respond to all demands.

He who can will dispense with primary batteries as a source for current and avail himself of the dynamo currents. Some form of dynamo circuit is now in use in the majority of cities in this country, even those of but a few thousand inhabitants, and can be utilized by the physician for his office work at least. The illustration represents a very compact, simple, efficient and not unornamental design for an electric outfit which was constructed for this laboratory and has been in use for some time and which gives entire satisfaction.

There are four switches at the base of the upper part. Each switch serves as a faucet to turn on a special form of current. From left to right the first switch is connected with a group of four Leclanché cells which can be placed at any convenient place near at hand; in this case they are in a closet a few feet away. The second switch is connected with the Thomson-Houston dynamo circuit which supplies the incandescent lamps by which the office is lighted. This is an alternating current with 124 alternations per second and

an electro-motive force of 52 volts. The third switch is connected with a circuit leading off from a direct current dynamo which provides power for a number of motors. The electro-motive force on this current is 500 volts, but before it reaches the switch the current passes through four 100 volt in-



candescent lamps which are seen at the top of the frame arranged in series. The fourth switch, the last at the right, is connected with a series of 30 Lecianché cells to be used as a source of supply for a direct current in case the direct current dynamo is not running. Here we have "on tap" electric energy in a variety of forms. and all that is further needed are instruments for controlling, transforming and measuring it and conveying it to the patient. These are kept in the drawers of the case below the row of switches. The small drawers contain electrodes adapted to every variety of treatment, and the large drawer at the botton holds the induction coils, controllers, transformers, and milliampere meters. A McIntosh current controller can be attached to the binding posts under switches two or three, and by means of it either the alternating or the direct dynamo current may be modified at will and adapted to the therapeutic requirement. When this controller is connected with the binding posts of switch three that is of the direct current, an induction coil placed alongside of it can be supplied from the controller with any necessary amount of current to keep it in action, or the induction coil can be supplied with current from the binding posts

of switch one. A Wotten or McIntosh transformer can be attached to the binding posts of switch two and by means of them this current can be made to heat a cautery of any size, or light an illuminating lamp for exploring the cavities of the body, as the nose, throat, or bladder. The current of the series of Leclanché cells brought to the binding posts of switch four serves as a reserve force in case of need, but in fact it is seldom called upon to do any work since the dynamos are in action during ordinary office hours.

With an electro-therapeutic outfit of this kind, the use of this agent in practice gives genuine satisfaction both in handling it and in witnessing the good results that can be brought about by means of it.

STATIC ELECTRICITY.

I rior to 1865 what was known of static machines was practically confined to the old time frictional machines; but since the advent of the Holtz machine the march of progress in the development of electro-static generators has been very marked. Dr. Wellington Adams, in writing on this subject, says: "Although not improved much electrically, the Toepler machine has, however, been greatly improved mechanically, and in its adaptation to the requirements of the medical profession, by Prof. Philip Atkinson, of Chicago, whose machine is manufactured by the McIntosh Battery & Optical Co.

This machine is admirably constructed mechanically, and after a careful investigation and an extended practical experience, the writer unhesitatingly pronounces it the cheapest, and at the same time the best machine upon the market for the purposes of the electro-therapeutist, because:

It is neat and compact, occupying but little space.

It generates as high an electro-motive force as many other forms of machines of from two to four times its size.

It does not get out of order readily, because of its superior mechanical construction.

It is provided with a simple, convenient and effective means of tightening the belt when this comes loose.

Its construction is such that it may be easily and quickly taken apart for cleaning.

It will generate a current *nearly* every day out of the year, when properly cared for, only failing two or three days out of the month, during the two hottest summer months.

It picks up its charge and begins to generate very quickly.

It runs very easily and smoothly, requiring but little power.

It is provided with a very superior and convenient method of securing the "induced" current, which produces physiological effects similar to the faradic current.

It will, when in good order, produce a spark equal in length to two-thirds of the radius of the revolving wheel.

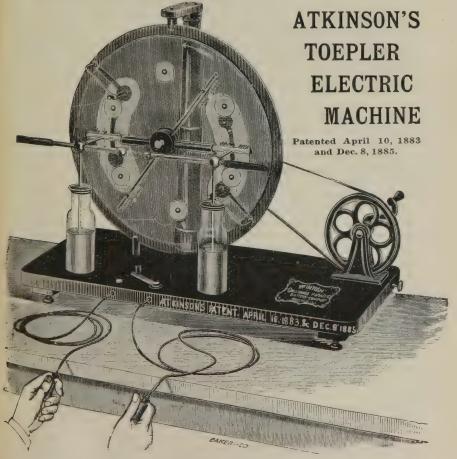
It is not so large as to entirely preclude the possibility of its being taken to the bedside; and the future will find this frequently done for the purpose of facilitating convalescence from low types of fevers, through the superior tonic influence of static electrizations.

Its peculiar and superior mechanical construction adapt it to be run by either hand or some form of mechanical power, which is not the case with some others.

"THE CHOICE OF CURRENT" should depend upon whether it is desired to secure a mechanical, or a chemical effect. Mechanical effects are dependent upon the rate of electric change in the motor nerve, rather than upon the volume of current in the nerve, and therefore, because of its intermittent character, the faradic current is best suited for the production of mechanical effects, such as the contraction of muscles and muscular tissues; while chemical effects are dependent upon the volume of the current flowing through the tissues, rather than upon the rate of change, and therefore, the galvanic cur-

rent, because of its constancy, is best suited for the production of chemical changes, such as accompany catalytic, electrolytic and electrophoric actions. Not, however, because there is any inherent difference in the two currents, but simply because of the different physical conditions under which they appear, the one being constant and the other intermittent. By using a galvanic current of small volume and high electro-motive force, and interrupting it with sufficient rapidity, effects may be produced identical with those of faradism; but the latter has the advantage of being generated by a much more compact and simple device.

The greater the rate of electric change or rise and fall of potential, and the smaller the volume of the current, the less will be the pain with equal degrees of muscular contraction. Hence it is that direct intermittent, or induced intermittent, currents of small volume and high potential, derived from electro-static induction machines, will induce more muscular contractions with less pain than even faradic currents.



An electro static machine of high tension and large quantity, whose sensitiveness to atmospheric influences shall not interfere with its practical working; has long been a desideratum with scientists. The cut represents such a machine. It is made with two circular plates of glass, one stationary, the other revolving close in front of it; two sets of combs and two Leyden jars, with a switch between them.

To the back of the stationary plate are attached two sets of paper and tinfoil inductors, connected with which are two wire brushes; and to the front of the revolving plate are attached six metal carriers with raised centers, which are brought into contact with the brushes, as the plate revolves, and generate the electric charge, which is rapidly increased by induction. Opposite parts of the plates and opposite inductors and carriers become oppositely electrified. condensation takes place in the jars, and sparks pass between the sliding electrodes, which may be increased to seven inches or more in length.

Electricity is generated at once, and the electric charge constantly sustained by the friction of the carriers and brushes; hence the machine remains in practical working order under the most unfavorable atmospheric conditions.

Recent investigation by leading physicians, among whom Dr. W. J. Morton, of New York, is prominent, has led to the discovery that static electricity is an important factor in medical treatment, and produces certain effects which cannot be obtained from current electricity. Improvements made in this machine, protected by patent, specially adapt it to medical practice. The most important of these is the application of

THE SWITCH AND ITS CONNECTIONS.

This, as seen in the cut, is placed between the Leyden jars and in connection with their outer coatings, so that the induced current between them is controlled by the operator. As this current flows at the same instant with the discharge between the sliding electrodes connected with the inner coatings, it is only necessary to separate them to obtain the interrupted induced current similar to the Faradic.

In connection with the switch are seen cable cords and electrodes, which may be held by insulating handles and applied to any part of the body. Opening the switch changes the current to the cords and electrodes, and on separating the sliding electrodes the Faradic effect is at once produced, which may be varied from the slightest tremor to the most violent muscular twitchings. A separation of one-sixteenth of an inch produces a mild, pleasant sensation; one-eighth to one-fourth of an inch becomes painful, while a separation of one-half to three-fourths of an inch can hardly be borne by the strongest nerves.

When the switch is closed and the sliding electrodes drawn out beyond sparking distance, a person seated on an insulated platform and connected by cable-cord with the ball surmounting the Leyden jar farthest from the driving wheel will receive a condensed charge of positive electricity, or of negative if connected with the jar nearest the driving wheel. When the charge has been sustained as long as desired, it may be drawn off by a sponge, roller, or point electrode connected with the other jar.

The current flowing from the point is known as the "electric wind," and produces a cooling, soothing sensation.

The heaviest clothing offers comparatively small resistance to static electricity, so that the removal of clothing is seldom necessary in medical practice; but its passage through clothing or the air always produces a spark, and a sensation more or less painful, as it strikes with accumulated force. A succession more or less painful, as it strikes with accumulated force.

sion of sparks concentrated on one spot produces irritation and reddening of the surface. The insulating handle and ring is used to keep the cable cord out of contact with the operator, patient and surrounding objects, and prevent sparks through its insulating envelope.

The display at night from this machine is very impressive; brushes and pencils of light stream and flash from every part, the space between the plates is filled with sparkling scintillations, sparks dart between the exectrodes like miniature chain lightning, while at every flash the rapidly moving disks on the revolving plate stand out as perfect in form as if motionless; thus proving that the spark is instantaneous, and the seeming time occupied in its passage an optical illusion. Moving the electrodes close together, the spark becomes apparently continuous, affording sufficient light to read fine print at a short distance. Here, then, we have practically the electric light with a static dynamo-machine and regulator. By using the Geissler tubes, giving the green, pink and violet colored lights, the effect is very beautiful, and can be varied, using either the direct or the induced interrupted current, for which this machine is specially adapted.

In damp, warm weather, a film of moisture sometime settles on the glass plates and temporarily suspends insulation, so that the machine ceases to generate. The simple and effectual remedy in such case is to *dry* and *warm* the plates, which may be done in a few moments by placing one or more kerosene lamps near them.

The machine should be wiped frequently with soft, dry flannel, and covered to protect from dust when not in use.

A glass protecting case. While it adds to the beauty and finish of the machine does not add to its effective working qualities, and in fact may detract measurably from the ease and certainty with which these machines under ordinary conditions act; unless the end doors of the case be left open during the time the machine is in operation, thus permitting free circulation of air. This precaution is under no circumstances to be neglected, when the plates are being warmed by lamps placed within the case, otherwise the moisture generated by the combustion of the lamp fuel will act as a hindrance to its action.

To Dr. W. J. Morton, of New York City, is due the credit for having first brought to the notice of the Medical Profession the entire adaptability of Static Electricity to all the methods of treatment to which the faradic (interrupted) and the galvanic (constant) currents are applicable.

The Kinetic form of Static Electricity, as developed by Dr. Morton, "produces a far greater and more powerful nerve and muscle stimulation per second than the spark form, and if discovered before the days of the secondary coil would at once have brought the frictional machine into the front rank of current administration." This system comprises the development by a Static Machine of a rapidly interrupted and graduated current, by means of a circuit breaker introduced into a circuit, and in the medical application of this current, without and within the human body by moistened sponge or other electrodes, just as in the case of the ordinary galvanic and faradic currents.

Through the agency of the Morton Static Interrupting Handle introduced at any desired point in the current and as far removed as may be desired from the patient, the disagreeable and painful effects of the spark are avoided, while yet retaining all the physiological effects of the Kinetic or current part of the circuit. Its applications are manifest, and in connection with the various special electrodes which we furnish, the spark may be applied along the urethral canal, uterus, throat or other internal cavity.

THE PLACE OF STATIC OR FRICTIONAL ELECTRICITY IN MEDICINE.

BY WILLIAM JAMES MORTON, M. D.

Reprinted from the Medical Record, May 31, 1890.

Although I do not care to come forward as a special champion of static electricity in therapeutics, using, as most physicians do, all means at command which I think will cure, still I cannot avoid a certain degree of responsibility in relation to its use, since its introduction in modern form into medical practice, in the United States, followed the reading of a paper by myself before the New York Academy of Medicine, on March 3, 1881, and the exhibition of machines and electrodes which I brought from Paris and furnished as models to manufacturers here.

Struck by its merits and its efficacy, as exhibited at Professor Charcot's clinic, I introduced it to the profession in a public way here in America, with a conservative desire to test its merits and have others do so.

Nearly ten years have elapsed; the therapeutic use of static electricity has extended enormously in medical practice, and it is to be expected that an effort should now be made to ascertain its rightful value. I read, therefore, with great interest an account of the proceedings of the Academy of Medicine, published in the Medical Record last spring, relating to 'The Place of Electricity in Therapeutics."

The reader of the paper of the evening. Dr. M. Allen Starr, argued that the attainable curative results of electricity were disappointing, and that static electricity was particularly inefficacious. The general subject was ably discussed, but the special attack upon static electricity has not yet been specifically answered. In a broad way I most heartily agree with the reader's opinion, shared to-day with a multitude of workers in electro-therapeutics as a whole, that electricity has not come up to the claims made for it. But is not the real trouble with the claims and not with the agent? If the effort to cure all disease by electricity is disappointing, is it not equally so by medicines or other treatment? Is not the progress of medicine mainly distinguished by increased familiarity with the natural history of disease, and its prevention or avoidance, and by the discovery and use of new drugs and means to relieve symptoms, mainly pain? To cure organic disease by remedies is yet apparently in a most backward state. Yet this has been expected of electricity, hence disappointment.

But if in place of expecting to cure a profound and established organic disease, we turn our attention to symptomatic and functional treatment, to the treatment among other things of pain, spasm, anæsthesia, hyperæsthesia, paralysis, and to nutritive faults, we may still have cause to find that electricity holds a preëminent place in medicine The real question is, What is its value relatively to other therapeutic agents?

This, however, is a digression from the main point of this communication, which is to courteously take issue with Dr. Starr as to his statements concerning the effect of static electricity in particular upon the human body. And to understand his position more fully, we may supplement his views appearing in the Record

by reference to similar views expressed by him in Scribner's Magazine for November, 1889, in an article entitled "Electricity in Relation to the Human Body."

If what Dr. Starr puts forward as facts in regard to frictional or static electricity is true, then I most cordially admit that this form of electricity has no place in medicine. But it is precisely that his statements of fact have no foundation that I think it worth while to point this out, lest unanswered, they may be accepted as authoritative.

Having stated the well-known observation that electricity at rest, or "static" electricity, resides on the surface of bodies which are charged with it, and having quoted the famous Cavendish or Biot experiment of the insulated sphere and its removable caps to demonstrate this very general statement, Dr. Starr states that the same is true of the human body, and "therefore frictional electricity never penetrates beneath the skin nor produces directly any effects upon the deeper tissues," though the "giving of the sparks causes a decided irritation of the surface" and produces "indirect effects," such as reddening and a conscious perception, as between the spark and the breeze or spray, that the one is disagreeable and the other agreeable; and also a sudden movement of the irritated part, as for instance, "one suddenly draws one's hand away from a lighted cigar before one realizes what is touched."

"But the same kind of indirect effects," he continues, "may be produced by any mild irritation of the skin. The general effect of static electricity, is therefore, about the same as that of a cold bath, or the muscle beating of the Swedes, the lomi-lomi of the Sandwich Islanders, the whipping with twigs in a Russian bath, the needle douche of a Turkish bath, or any other sharp mechanical irritant."

And again. "It seemed strange how much credence was still given static electricity in therapeutics, for its action was limited exclusively to the surface of the body charged; it did not penetrate the skin, could not permanently charge the body, and could produce a curative effect only as a surface irritant or by reflex action," All this of course, while giving sparks, for this method of administration is assumed or referred to as the one producing the indirect effects and failing to produce anything more. This is indeed a severe arraignment of static electricity in medicine, and if true, leaves it no ground to stand upon.

We will meet the situation at once by direct experiment, and by pointing out the incredibility of the statements according to the laws of electrophysics. The main points at issue are covered in by the statement that "frictional electricity never penetrates beneath the skin, nor produces directly any effects upon the deeper tissues," and that its "action is limited exclusively to the surface of the body charged."

A speedy refutation of the exclusive superficial action claimed is found in the following simple experiment: We place in the hand of a fairly muscular subject, standing upon the insulated platform, a weight say of ten pounds (an Indian club is preferable, since the nearness of a metal weight weakens the spark), and causing him to raise it until his arm is at right angles, we administer a single and ordinary spark to the motor point (or almost any point) of his biceps muscle. The weight is raised half an inch or more, and by successive sparks we may vibrate the weight in unison with the spark. Query: Has not the frictional electricity "penetrated the skin" and caused an "effect upon a deeper tissue," viz., the biceps muscle?

Careful efforts with twigs, douche, cold baths, lomi-lomi, and nearly all the agents mentioned as having "about the same general effects as static electricity," failed in our hands to elicit any visible contraction of the muscle and raising of the weight, and we conclude, what is well known, that the effects are not comparable except in a most remote manner.

Again, while the subject is seated in a chair upon the platform, we lay a twenty-pound dumb-bell upon the thigh, half-way between the groin and the knee, and give a spark to the motor point of the vastus externus muscle. The dumb-bell is raised half an inch, and this, too, by the bellying or bulging of the muscle, and not by direct pull. The same effect will be produced even if we give the spark to the dumb-bell itself, well illustrating the principle which is at the bottom of all this stimulation of nerve and muscle, viz., that static charge in the act of discharge becomes kinetic, current, or flowing, and traverses the human body as it would any other conductor.

Let us for one moment pause to consider the amount of work done by the spark: One pound raised 1 foot in 1 second equals 1 foot pound.

One pound raised ½ inch in 1 second equals $\frac{1}{24}$ foot-pound. Twenty pounds raised ½ inch in one second equals $\frac{20}{24}$ foot-pound, or, say 1 pound.

A single spark therefore represents a muscular energy expended equal to raising 1 pound 1 foot per second. But I can easily give, say, 5 sparks per second. The muscle therefore raises 5 pounds per second, and to raise 550 pounds (the unit of horse-power) will require 110 seconds, or about 2 minutes. The actual work, therefore, capable of being accomplished by the muscle under the stimulus of the spark is at the rate of 1 horse-power every 2 minutes, or ½ a horse-power per minute.

That this estimate is very moderate will occur even to our critic, since he himself writes that "the amount of energy in the spark is proportionate to the expenditure of energy in friction." This may be demonstrated experimentally by placing two machines opposite to one another, pole to pole, and turning one when the second will itself begin to turn. In treatment, the product of the machine expends itself upon the patient in a manner to be mentioned later on, and if the man-power turning the crank be resolved into units of horse-power, the above showing would be much increased.

And what is accomplished by a single little spark with the biceps and the vastus externus, may be accomplished with practically every muscle in the body. A spark to the deltoid throws the arm out from the side of the body, and, what is equally interesting, throws the entire shoulder group of muscles into contraction, so deep and widely diffused is the effect. Thus, also, a spark to the anterior region of the thigh will throw its entire mass into contraction. Each smaller muscle may be sought out and caused to contract just as it would under similar circumstances, by the interrupted galvanic or the faradic current.

All this seems too trite to say; everybody who has used static electricity knows it, and it is certainly a most interesting neurological anomaly to have denied it.

Dr. Starr seems to have confounded, as I have already intimated, frictional electricity at rest with the same in motion—in the former state truly "static," in the latter "kinetic," or flowing in conductors, and most powerful to stimulate nerve and muscle and produce contractions, as well as to excite nerves of special sense.

Physiologically as well as in practice, it is well known that the muscular tissue is exceedingly sensitive to the feeblest discharges of static electricity. The sparks of a distant frictional machine set the frog's legs in contraction which drew Galvani's attention to the new form of electricity.

And again, the Abbé Nollet convulsed the arms and shoulders of an entire regiment of 1,500 men by causing them to join hands in line, and then completing the circuit by a spark of static electricity from a Leyden jar, just as in our present methods of administration, except that we do not require as strong an application. The ordinary ball electrode represents one tin foil coating of the jar, the air the glass dielectric, the charged person the other coating; when the discharge or spark occurs the differences of potential are equalized by an instantaneous flow of electricity throughout all portions of each charged conductor, and if the electrical continuity of our tin foil coatings happens to be extended to a regiment of men or to the biceps muscle, the effect will be to "penetrate the skin" and affect deeper tissues.

That frictional electricity, when static, resides upon the surface is one way of making the statement. To avoid argument we will admit it. We will say, then, that the person sitting upon the insulated stool receives the electric charge upon the surface.

But while bringing forward one fundamental law of electricity, Dr. Starr ignores another one equally fundamental, which is that the potential at all points of a conductor on which electricity is at rest must be uniform; if it were not, there would be a flow between the two unequal potentials until it became uniform; hence the potential inside a conductor has the same value as at any point on the surface.

It follows that at the moment of discharge (spark) the equalizing of the potentials proceeds from and to all parts of the conductor (human body), inside and outside, and we here have the current which produces the effects on nerve and muscle. And the conducting power of the charged conductor is proportional, not to the surface, but to the mass of the conductor, for a solid rod of a given diameter will convey a current which would melt a thin tube of the same diameter.

Given, then, a surface charge upon the body, and the first spark changes the entire situation. The spark is a current, but it is only the air part of the current—the evidence of the breaking down of the strain in the fluid dielectric; the remaining continuity of the current is in the patient's body, not on it (for the potential is uniform), in the chain going from the platform to the machine, and so on up to the initial electro-motive force of the Holtz machine, and around again in a closed circuit to the ball electrode which gave the spark. The conditions do not vary essentially from those existing in a galvanic cell or a storage battery. When we close the circuit we get the current, and it is this current which localized by an electrode, traverses the human body at any desired point—a current of, say, 50,000 volts as against 1 volt of a Daniel's cell -put to work to overcome the resistance of, say 2,500 ohms of the body; a resistance so trivial in comparison with the voltage or pressure that it may be disregarded entirely—a current oscillating (alternating) 100,000 to 1,000,000 times per second, compensating, as regards its physiological activity, for its loss in quantity, by its enormous electro-motive force and by its exceeding rapidity. The wonder would be that nerve and muscle and all tissues should not be stimulated. The fact is that they are. And Dr. Starr's entire structure, based upon static charge, falls to the ground in the light of the discharge and its accompanying current and physiological effects, and he should alter his apparently thoughtless dictum and write, "frictional electricity, as commonly administered, penetrates beneath the skin and produces directly effects upon the deeper tissues."

In conclusion, to leave facts and venture a single opinion, I believe that no form of electricity "penetrates" more deeply than the static; and, premising a powerful machine, a powerful spark, a conservative expectation as to results, a fair comparison with galvanism and faradism, and intelligent selection of cases, and a fair amount of skill in administration, I believe that no form of electricity equals it in curative effect.

THE FRANKLINIC INTERRUPTED CURRENT.

"Applied to a motor point, the Franklinic Interrupted Current produces most vivid and persistent muscular contraction with a minimum of pain; applied farther back on the trunk of a motor nerve it throws large groups of muscles into contraction. The contraction is peculiarly painless as compared with that of faradic coils, and the influence is remarkably diffusive.

Its penetrating, diffusive, painless effect, with strong muscular contractions, adapt it admirably to general application over the entire body as an electric in place of an ordinary massage. It is, of course, applicable to every form of muscular paralysis, for there is no practical stimulus to nerve and muscle except the electric, and none more energetic than this form of it.

The second prominent characteristic of this current is its power of relieving pain. Leaving out of sight the part, be it more or less, played by circulatory changes referred to, in this respect there seems to exist a specific analgesic quality in the current. The cotton feeling in the hands, and subjective sense of buoyancy in the arms is in itself an evidence of this. But the effect upon pelvic pain, upon ovaritis, upon neuralgias, pleuritic "stitches," tonsillitis, and many other pain affections is still better evidence. In sciatica, for instance, the sensation of pain is frequently quickly relieved and a cure obtained, though I think in this case the cause is two fold, that is to say due to both the circulatory and analgesic effect. The same I believe is true in the pelvic and ovarian pains. The results in such cases in my opinion, are far superior to anything attainable by a faradic or a galvanic application. Gvnecologically my system of conveying the current within the cavities of the body opensout a wide and promising field of clinical results. To improve the nutrition and remove the pain in and about pelvic organs in itself covers a large number of conditions of the uterus and its appendages, not yet so thoroughly combated as to allow any one to say that he can do without an agent so potent to relieve pain and restore local and capillary circulation, and set up favorable nutritive changes as the Franklinic current has demonstated itself to be."

The above extracts are from a very valuable monograph by William James Morton, M. D. The Franklinic Interrupted Current.—Medical Record. Vol. 39, No. 4.



STATIC INDUCED CURRENT.

Open the switch, separate the discharge rods one-sixteenth of an inch, or a little less, connect the poles on either side of the switch with two conducting cords and electrodes, hold one in each hand, or apply to any part of the b.dy; to increase the strength of the current separate the discharge-rods slightly. Sensation like a current from a Faradic Battery.

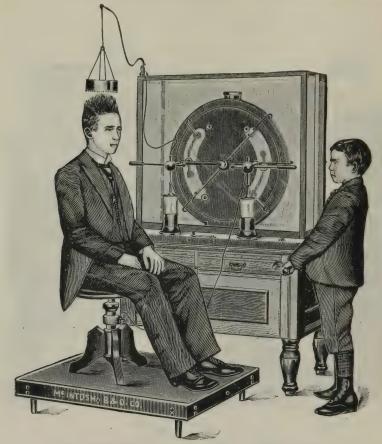
To William James Morton, M. D., of New York City, we are indebted for all we know of this exceedingly valuable currrent. He discovered it: he elaborated it; he was the first to write about it, and the first to define its nature and uses.

Extract from letter of W. D. Cole, M. D., Ft. Dodge, Iowa, Feb, 25, 1891.

GENTLEMEN:—The Static Battery which I purchased from you at your office last October gives perfect satisfaction, having much more than paid for itself in additional practice which I would not have had but for the Battery.

Yours respectfully,

W. D. COLE, M. D.



THE STATIC BATH OR HEAD BATH.

STATIC INSULATION.—Place the patient on an insulated stool, close the switch, draw out the discharge rods 6 or 8 inches, connect the patient with either the negative or positive poles of the machine with a conducting cord.

Indirect Spark—While the patient is in the above position, with the hand or an electrode, sparks can be drawn from the patient. (Connect electrode with a cord and let cord connect with the floor.)

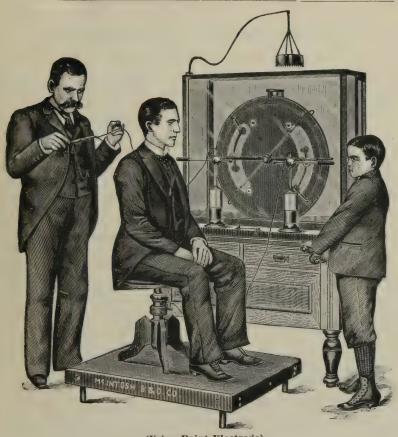
The Direct Spark.—Close the switch, separate the discharge-rods 6 to 8 inches, connect one pole with a cord and electrode, apply to the patient, using care that the cord or patient does not connect with the other pole or the one which has no cord connection.

Static Breeze.—Connect same as above, only connect a point electrode with the cord and direct the point toward the patient 2 to 6 inches from surface.

Dr. J. D. Arrington, Hurtsboro, Ala., under date of Dec. 28, 1891, says: "Gentlemen, you be leaved as the by Adams Express at once an Atkinson-Toepler Electric Machine like inclosed cut. I have used one of your Static Machines for the past twelve months at St. Louis, and in transportation the express company ruined it completely. Please ship at once and hurry through. For nervous prostration, rheumatism and neuralgia this particular Battery is a specific cure."

Yours truly,

J. D. ARRINGTON, M. D.



(Using Point Electrode).

STATIC LOCALIZED BREEZE.

In case it is desired to localize the static breeze the Static Point Electrode may be used as shown in the above illustration, or Dr. Sharp's Static Breeze Electrode may be used.

MINTOSH B 845. CO.

DR. SHARP'S STATIC BREEZE ELECTRODE. \$4 00 Price

ABSTRACT FROM A MONOGRAPH ON

STATICAL ELECTRO-THERAPEUTICS.

By Ambrose L. Ranney, M. D., New York City.

(From the Physician and Surgeon.)

I have had ample opportunities to observe in the daily routine of my practical office work the effects of static electricity upon many patients afflicted with diversified diseases. In preparing this article I have carefully searched through the records of quite a large number of cases where it has been most successfully employed by me. I have been struck in many instances with the rapidity with which it effected an apparent cure; in other cases, with the permanency of its beneficial results; and in all, with the simplicity and ease of its application. To a lady, for example, it is a matter of no small moment that she is freed from the necessity of divesting herself of any garments worn and that almost any part of the body can be treated without exposure or annoyance. To the busy practitioner also, to whom time is valuable, it is not unimportant that several patients can be treated simultaneously; and that no delays are caused by waiting for each one to remove and replace their clothing.

Again, the application of "static insulation" is far more agreeable than "general faradization" or "general galvanization;" and, in my experience, it is fully as efficient in many cases in its remedial action as either of the methods referred to. The inconvenience to the patient of having to disrobe almost completely, and the distaste which many naturally exhibit to having a wet electrode or the operator's wet hand rubbed over the skin, for from ten to twenty minutes is entirely obviated. With a sufficiently large insulated platform several patients can, if desired, be given a static bath in the physician's consulting room in the same period of time as would be consumed in administering general faradization to one patient and be spared the annoyances mentioned.

I do not mean to infer that some cases do not require the use of faradic or galvanic treatment; nor would I be construed as casting any reflection upon the therapeutical value of the methods which were first suggested and employed by Drs. Beard, and Rockwell, of New York. The question at issue is simply one of convenience to the patient and the physician; provided that the indications of the case justify the trial of the static bath as a substitute for "general faradization" or "general galvanization."

In the second place, I think it has been justly claimed for static electricity that some of its therapeutical effects are more certainly and rapidly obtained than by means of any other form of electrical application.

It is extremely difficult to formulate general deductions respecting any therapeutical agent. Such attempts necessarily tend to evoke criticism; because exceptions to every general statement may be brought forward as evidences of their unreliability. I am, however, inclined to offer the following general deductions respecting static electrical applications for the benefit of the reader; with the proviso that they may not apply to every case, and that they be not construed too literally:

First.—My experience has not confirmed the view (heretofore advanced by some authors) that the positive pole of a static machine has a "tonic" and the negative pole a "depressant" action.

I have found, after repeated experimentation, that either pole seems to

answer equally well upon most patients. I commonly employ in my office the positive pole, however, because it happens to be the most conveniently connected with the patient.

Second .- As a curative agent, I regard static electricity as of great value.

While galvanism must always hold a preëminent place in electrical therapeutics, because of the chemical effects so obtained, there are certain diseased conditions in which static electricity is unquestionably superior to faradism and galvanism.

Third.—It has been shown in preceding pages that the static induced current fulfills all the known indications of faradism.

It has moreover two great advantages over the faradic instrument, namely that a constant polarity is obtained and a much greater electro-motive force. It is also less painful than the faradic current.

Fourth.—Static electricity possesses a decided advantage in some cases where faradization or galvanization have either given negative results or have apparently lost their remedial power after their use has been too long continued.

It is a common expedient with medical electricians to shift from one form of current to another from time to time whenever the progress of the case seems unsatisfactory. Under such circumstances Franklinism forms another link to the chain; and greatly aids us when faradism and galvanism have both proven inefficient.

Fifth.—I have found heavy static sparks to surpass any other form of electrical application for the relief of contractured muscles.

The sparks are withdrawn from the part so affected in rapid succession for about five minutes.

Sixth.—It is well known that certain forms of pain often disappear at once after static applications.

The most marked type of pain so relieved is the so-called "rheumatic muscular pain" or that observed in genuine muscular rheumatism. I have seen many such cases where one application of heavy sparks to the seat of pain for a few minutes has caused permanent relief. Again, neuralgias of a distressing kind are often dissipated after a few applications of heavy indirect static sparks for from five to ten minutes at a sitting.

Seventh.—As a general tonic and also as a stimulant to depressed nervous functions "static insulation" seems to be particularly of service.

I employ static electricity constantly by this method in neurasthenia, with marked benefit.

I have observed also remarkable improvement in disturbed visceral functions (such, for example, as dyspepsia, habitual constipation, diabetes, vertigo, asthma, etc.) after the use of static insulation for from ten to twenty minutes at a sitting.

Many such cases have expressed to me the greatest delight at the beneficial effects which such an application invariably produced. For the past three years, I have used my static machine almost exclusively as a means of improving the "general nervous tone" of patients, in preference to my faradic or galvanic apparatus. It is much more satisfactory to patients because of its ease of application; and as far as I have observed, equally effective as a tonic.

Eighth.—I am inclined to think that those avcors who have written upon static electricity as a therapeutical agent in a lukewarm spirit, have probably

been supplied with an apparatus which has been ineffective because it generated too slowly or imperfectly.

Static electricity is to-day, for the second time, generally recognized by the profession as a valuable therapeutical agent. Most of the leading neurologists have now a Holtz induction-machine as a part of their office equipment. The later editions of recognized works upon electricity as applied to medicine show almost without exception that this variety of electricity is deemed worthy of more attention than it received in the earlier editions. It has passed through its stage of neglect and distrust safely. It is steadily regaining the popularity it so justly achieved in the eighteenth century.

156 MADISON AVENUE, NEW YORK CITY.

ATKINSON'S TOEPLER ELECTRIC MACHINE

Is Fully Protected by Patents.

Beware of inferior, fraudulent imitations of the Atkinson Toepler Electric Machine. Please remember that every genuine machine is stamped:

"ATKINSON'S PATENT," APRIL 10th, 1883, and DEC. 8th, 1885.

The McIntosh Battery and Optical Company are the sole owners of the "Atkinson Patents," and we shall prosecute any party or parties found infringing our vested rights.

To Whom it May Concern, Take Notice: We have found it necessary during the past year to proceed against certain parties who have been infringing our rights. In the United States Circuit Court, Northern District of Illinois, we have obtained a decree against two parties, and other suits are pending. Physicians or others are warned against purchasing these machines offered by manufacturers who are infringing our vested rights under the Atkinson patents. And due notice is here given that we shall, under the decree already given in our favor, proceed to recover damages, not only from the infringing manufacturer, but from each and every purchaser of such machine bought in defiance of our rights.

Place your order with the McIntosh Battery and Optical Company, who are the sole owners and only rightful manufacturers of these celebrated Atkinson Toepler Electrical Machines, and you will be sure of the best results at the lowest price and perfect immunity from danger of patent suits.

The persistent efforts of unprincipled parties during the past years to steal from us the patent-protected features of this machine is a frank confession of the superiority of the Atkinson Toepler Electric Machine over all other influence machines.

List of Sizes and Description of Accessories.

The small machine in the following list has sufficient energy for ordinary medical or scientific work, and is often convenient on account of being portable.

The large machine is preferred where electricity is made a specialty. It has great energy, a very smooth induced current, and its impressive appearance and powerful effects make it desirable in an office outfit.

A machine with four plates will be found vastly superior to a machine with only two plates. α .—In the rapidity and ease with which a current is generated. b.—In the increased quantity of current.

While the greatest demand at the present time is for the large machines with four plates, yet there is a growing inquiry for still more powerful machines, and we are meeting this demand with our magnificent eight plate machine. This machine in its construction is essentially a double four plate machine, the entire current being brought to one pair of static jars, arranged precisely as on the four plate machines.

This very powerful machine is furnished with glass enclosing case and table. The glass case is very desirable, in fact we think indispensable with the large machines, as a protection against dust and possible injury and as giving opportunity in any climate where the atmosphere is very humid to easily produce an artificial, perfectly dry atmosphere within the glass case.

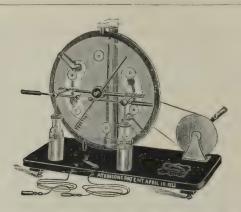
We desire to impress upon physicians who are canvassing the merits of the various forms of "Influence Machines" that the McIntosh, Atkinson Toepler Electric Machines are self-generating; they do not require to be given an "initial charge" to bring them into action; they do not require to be enclosed in hermetically sealed air-tight case; they are the only form of static machines which will instantly pick up its charge and fall into action; they are the only form of static machines which can be operated in the open air, at any season, and in any climate, and under conditions of atmospheric humidity which would render it a hopeless task to attempt to obtain satisfactory results from the various other forms of Influence Machines.

We advise the use of a protecting case but advise that the doors of case be left open when the machine is in action.

Under atmospheric conditions of extreme humidity or in a uniformly damp and humid climate, drying material can be used (fused chloride of calcium being the best hygroscopic material for this purpose), and under such precaution the Atkinson Toepler Machines will give entirely satisfactory results in any climate and on every day and hour of the year.

Dr. Horatio R. Bigelow, 1716 Chestnut Street, Philadelphia, under date of Feb. 15, 1892, says:

[&]quot;The Static Machine is most admirable. Take it for all in all, permanence, power, endurance and cost, it approaches more nearly the ideal machine than any other that I know of. The workmanship is most handsome and the moral effect of it in one's office is good.

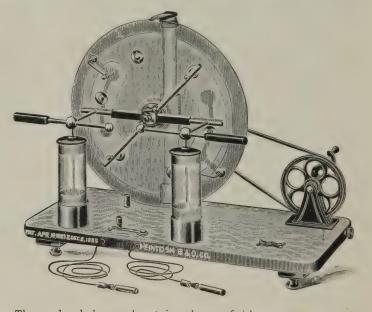


Without Glass Case.

The woodwork, base and post, is mahogany finish.

Machine with two Glass Plates, 16 and 18 inches in diameter...... \$ 60 00

Machine with four Glass Plates, 16 and 18 inches in diameter....... 100 00





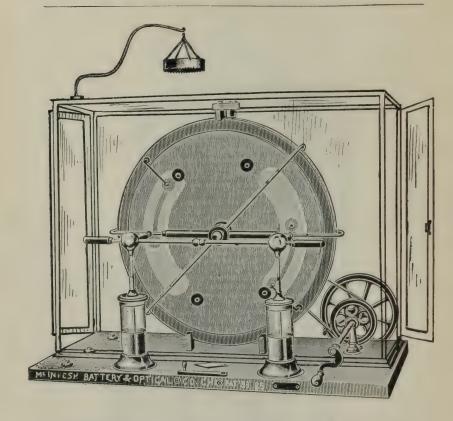
With Glass Protecting Case.

We can furnish woodwork of this style machine, either walnut or oak. Price of 4-plate (25 and 28 inch diameter) Atkinson Toepler Electric Machine, as shown in above cut, geared to oper-

N. B.—Storage Batteries will be found to be a very costly source of power unless the batteries can be regularly charged from a dynamo. For prices see

Index, Motors.

The maximum speed of these machines should not exceed 300 revolutions per minute.

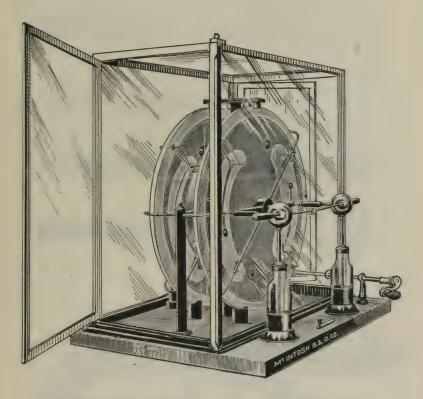


With Glass Protecting Case but without Table.

We can furnish woodwork, either walnut or oak. Size of base, 43 inches long by 21 inches wide.

Price of 4-plate (25 and 28 inch diameter) Atkinson Toepler
Electric Machine, as shown in above cut, geared to operate
either by electric motor or by hand......\$268 00

Dr. H. G. Hopkins, 220 Jersey St., Buffalo, N. Y., letter of April 26, 1895, expressing his satisfaction with large static machine (see page 187), says: "You can thank Dr. J. F. McCarthy, of Dubuque, Iowa, for the sale. I met him in New York City, and in talking of the subject he was so enthusiastic over your treatment of him that I concluded to try you after looking up the subject."



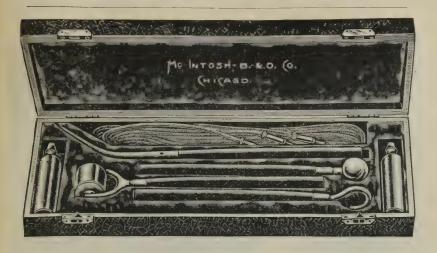
With eight plates (25 and 28 inches in diameter). Machine geared to operate either by electric motor or by hand. Complete with glass protecting case and table. Size of table top, 2'5" x 3'9". Woodwork either walnut or oak.

Price, as above described.....\$440 00

ELECTRODES AND ACCESSORIES FOR STATIC MACHINE.

SINCE STATIC ELECTRICITY has great tension, special electrodes are required for its therapeutic application, which are represented by the following cuts:





STATIC ELECTRODE CASE.

This case contains one pair static cords and handles, one static point trode, one roller, one hook and one ball electrode. Price\$14 00	ele	eç-
Insulating Platform, carpeted, 21x27 inches, with Hard Rubber Insulators	8	00
8. Static Crown, for head breeze (nickel-plated, with chain)		00
This Electrode is furnished without extra charge, with all four pla		
and 28-inch machines in Glass Case.		
Pair Hard Rubber Insulating Handles for Sponge Electrodes, per pair.	2	60
Pair Sponge Electrodes		80
Static Cords (green silk), per pair	_	00
Static Wire Brushes, each		2.5
Static Machine Plates, 16-inch Revolving	- 1	00
" 18-inch Stationary	_	00
" 25-inch Revolving		60
	11	00
Static Machine Table, for 25 and 28 inch machine, in polished oak or	20	00
	3%	00
Static Machine Table, for 16 and 18 inch machine, in polished cak or	20	00
walnut	0.0	00
	-	-
MINTOSH B & O. CO.		

Price by mail, postpaid, \$1.50.

This very valuable little work by Philip Atkinson, M. A., Ph. D., will be found well worthy of careful study, by those persons who desire to acquaint themselves with the principles of the science, as well as by students of science who desire to refresh their msmory of the work of bygone years in the classroom or laboratory.

NEW STATIC ELECTRODE.

Dr. Lucy Hall-Brown, of Brooklyn, N. Y., has designed a new form of static electrode of which she speaks as follows:

It is an electrode for general treatment. There is not the slightest danger of a spark jumping from it and yet the spray may be localized at any point or part of the patient's body.

It is a stick of ash three-fourths of an inch in diameter and three feet long; dull-pointed at one end and terminating in a handle or wooden ball at the other.

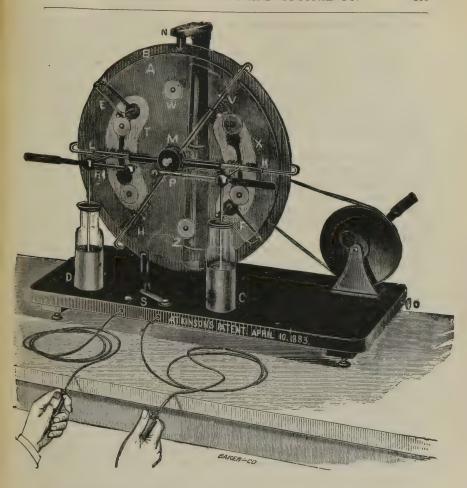
The stick after being nicely smoothed with sandpaper is covered with enamel gold paint and when thoroughly dry the paint is pretty well rubbed off by sandpaper but leaving all the crevices of the wood filled with the gold paint. The surface of the stick is then thoroughly covered with shellac. There will be sufficient conductivity in the gold paint remaining in the crevices and grain of the wood to carry the static current nicely and yet sufficient cannot accumulate to cause sparking. With this electrode the operator stands well off from the patient and may rub the pointed end on any part of the patient's body—under the arms, behind and on top of the knees, at the throat, in the nose or mouth, around the neck, on the head, etc. The spray is very strong and can thus be localized without danger of the spark. It is an excellent electrode for nervous and timid patients.

The shellac covers the stick to within three or four inches of the pointed end.



Price SHARP'S OZONE INHALER. \$14 00

By means of Sharp's Ozone Generator it is possible to apply the ozone treatment in a satisfactory manner. The instrument should be connected to the positive jar of the machine, in place of the head breeze electrode. If the mouth of the jar is held within a few inches of the mouth of the patient, the current escaping at a very high tension from the many points in the jar breaks up the air into ozone, which is inhaled in its nascent condition into the lungs.



Directions for Setting Up and Operating Atkinson's Improved Toepler Electric Machine.

SETTING UP THE TWO PLATE MACHINE.

You will receive the machine properly set up and adjusted, as in the above cut, except that the glass plates have been removed and packed in a separate box.

Before replacing them, examine the machine carefully and notice the exact position of every part. Then unscrew the nut from the front of the rubber disc M, and (in the large machines) loosen the binding screw on its upper edge.

Lift up the balls which surmount the conducting rods in the Leyden jars \mathcal{C} and \mathcal{D} , holding down the rods firmly. The combs K and L turn in the rubber insulators to permit the lifting of the balls. Then take off the whole set of combs and attachments complete, lay it aside carefully and remove the washer, if there is one.

Next remove the small pulley, with hollow shaft and rubber hub attached, leaving the belt on the stationary shaft.

Remove the cap N by unscrewing the two screws in the top of the post, leaving them still in the cap with their points projecting, so as to be easily replaced.

Now set the stationary glass plate B, turning the paper inductors T and X toward the post, and placing it very carefully in the rubber insulators at the points marked on the glass, holding it perfectly vertical to prevent any strain on the glass or insulators. Replace the cap N with its rubber insulator at the point marked on the glass above, as in the cut, and screw it down tight, first noticing carefully that the three rubber insulators are exactly at the places marked on the glass.

Next replace the small pulley and shaft with rubber hub attached, putting the belt into its groove and pressing the pulley snug against the post. Then unscrew the rubber nut from front of the hub, and place the revolving glass plate A very carefully on the central projection, with its six carriers turned toward the Leyden jars. See that it lies flat against the rubber, and then replace the rubber nut, screwing it moderately tight, so as to clamp the plate firmly.

Next replace the combs and attachments, pressing down the balls so that the rods from the Leyden jars shall reach the bottoms of their sockets, as before removal. Screw on the nut at M and tighten the set-screw, first noticing carefully that the sliding rods R and P are in line and that the two rods connecting the balls with the combs are parallel with each other.

Next attach the brush-holders F and E to the stationary plate B, placing the nuts and washers on the back and bringing the brushes to the front, directly over the centers of the tin foil conductors, as shown in the cut. Screw the nuts tight, so that the brushes shall be held firmly in position. Tightening the nuts will not crack the glass, but care must be used to avoid leverage on the glass in adjusting the brush-holders to their positions.

Now screw the rubber handle to the crank of the driving-wheel, and revolve the plate A carefully in the direction of the arrow, and if all the parts are in proper position, the plate will revolve smoothly and easily, and the raised centers of the six carriers will touch all the brushes lightly.

The brushes can then be adjusted by loosening the set-screws with the little screwdriver furnished for that purpose only; but special care should be observed to have them touch the raised centers of the carriers very lightly, especially the brushes at V and H; and not on any account to touch the glass.

The belt can be tightened when necessary by the thumb-screw O.

Be careful not to injure the threads of screws and nuts by starting them wrong.

Oil lightly the bearings of the central shaft and drive-wheel shaft. Dropping the oil between the small pulley and the washer next to the post will be sufficient for the central shaft, from which oil-holes are purposely omitted, as the electrified oil from such holes is liable to be discharged over the plate.

Directions for Setting up the Four-plate Atkinson Improved Topler Electric Machine

You will receive the machine with the glass plates removed and packed in a separate box, but the armature and brushes in position, which must now be removed in order to replace the plates. Remove the four bent arms, II, V, L, and K, by taking out the roundheaded binding screws that holds them in 'place. These arms are each fitted only to the sockets from which you have just taken them; as they are soon to be replaced care must be taken to have each arm in the socket it belongs, and to prevent the possibility of mistakes a small number is stamped on the arm and a corresponding number on the under side of the rod containing the socket.

Now unscrew the nut from the front of the large rubber disk, M, and loosen the binding screw on its upper ledge; lift the balls which surmount the Leyden jars (the combs will turn in the rubber arms to permit this), take off the whole set of combs and attachments complete and remove the flat rubber

nut and large rubber washer.

Raise the cap N (do not remove it) by unscrewing the screws in the top of the post, leaving them still in the cap, so as to be easily replaced. Put on one revolving plate (they are both alike) with the metal discs turned toward the post, then put in place the rear stationary plate, as per printed directions on the plate, and replace the large hard rubber washer. Mr. B.—When these stationary plates are in proper position the paper inductors stand perpendicular to the base of the machine, and as the observer stands in front of and facing the machine, the perforations for the brush-holders are at upper left-hand and lower right-hand of the plates. Now put on the front stationary plate as per printed directions on the plate and replace the screws in top of post so the stationary plates will be held securely in place; then put on the second revolving plate with the metal discs turned toward the Leyden jars, and screw on firmly the large, flat, hard rubber screw.

Replace the set of combs and attachments, pressing down the balls so that the rods from the Leyden jars shall reach the bottom of their sockets, and when the sliding rods R and P are in line, tighten the set-screw on top of the

large hard rubber disc M and put the nut on in front.

Replace the bent arms in the sockets, taking care that the number on the arm corresponds to the number on the end of the rod containing the socket; put the generating brushes E and F on the front stationary plate and the corresponding ones on the rear stationary plate, placing the nuts and washers of those on the front plate on the side nearest the post and the nuts and washers of those on the rear plate on the side nearest the jars, bringing the brushes to the front and back directly over the centers of the tin foil inductors as shown in the cut; screw the nuts tight so that the brushes may be held firmly in position.

By means of the small set-screw adjust the brushes so that they shall just touch the raised centers of the metal discs. Do not allow them to touch the glass.

The belt can be tightened when necessary by the thumb-screw O.

Directions for Setting up the Four-plate Atkinson Improved Topler Electric Machine

You will receive the machine with the glass plates removed and packed in a separate box, but the armature and brushes in position, which must now be removed in order to replace the plates and glass case.

Remove the four (4) bent arms H, V, L and K, by taking out the roundheaded binding screws that hold them in place. These arms are each fitted only to the sockets from which you have just taken them; as they are soon to be replaced care must be taken to have each arm in the socket it belongs, and to prevent the possibility of mistakes a small number is stamped on the arm and a corresponding number on the under side of the rod containing the socket.

Unscrew the hard rubber handles from the sliding rods, remove the rods from the balls surmounting the jars, and take off the Leyden jars (they are held in place by bayonet catches), and unscrew the horizontal rods with the balls attached from the combs K and L.

Unscrew the nut from the front of the large hard rubber disc M and loosen the binding screw on its upper edge; take off the whole set of combs and attachments complete and remove the large flat rubber nut and the rubber

washer.

Raise the cap N (do not remove it) by unscrewing the screws in the top of

the post, leaving them still in the cap so as to be easily replaced.

Put on one revolving plate (they are both alike) with the metal discs turned toward the post, then put in place the rear stationary plate as per printed directions on the plate, and replace the large hard rubber washer.

N. B.—When these stationery plates are in proper position the paper inductors stand perpendicular to the base of the machine, and as the observer stands in front of and facing the machine the perforations for the brushholders are at upper left-hand and lower right-hand of plates. Now put on the front stationary plate as per printed directions on the plate, and replace the screws in top of post so the stationary plates will be held firmly in position; then put on the other revolving plate with the metal discs turned toward the Leyden jars and screw on firmly the large, flat, hard rubber screw.

Replace the set of combs and attachments, and put the nut on front of

hard rubber disc M, but do not tighten set-screw on M

Put on the bent arms, taking care that the numbers on the arms correspond to the numbers on the rods containing the sockets. Next put the generating brushes E and F on the front stationary plate and the corresponding ones on the rear stationary plate, placing the nuts and washers of the brushes on the front plate on the side nearest the post, and the nuts and washers of those on the rear plate on the side nearest the jars.

By means of the small set-screw adjust the brushes so that they shall just touch the raised centers of the metal disc. Do not allow them to touch the glass

plates.

Place the glass case over the plates, turning the side with holes in the glass toward the front; screw it to the base, noting carefully the screw holes already in the base. Through the holes in the front glass insert the rods with the large balls attached and screw them into the combs K and L; replace the Leyden jars, pressing down the balls firmly so that the vertical rods shall reach the bottom of the sockets; tighten the binding screw at upper edge of M, and screw up firmly the binding nuts on the horizontal rods at K and L.

Put the sliding rods with balls attached through the holes in the large balls surmounting the Leyden jars, screw on the hard rubber handles, and the

machine is ready to operate.

In the machines which are geared to run by either hand or motor the rod in front of table throws the motor in or out of gear—pulling the rod out throws the motor in gear, and vice versa. The large thumb-screw at end of table throws the handle in or out of gear.

In bringing the machine into action do not separate the balls on the sliding rods until the machine is in motion and the current generating. The observance of this precaution may prevent danger of rupturing the glass of the

Leyden jars.

If the revolving plates require any adjusting to make them run perfectly true, it is done by insertion of paper behind the plates.

We take pleasure in presenting a few extracts (covering advice to beginners), from a most admirable "chat" on "A Plunge into Electro-Therapeutics," by S. H. Monell, M. D., in the *Times and Register*, March 16, 1895.

First, make yourself a skilled physician; then study the physics, physiology, mechanics and chemistry of medical electricity; then seek practical instruction in the technique of applying its general principles to the treatment

of patients, and finally buy your outfit.

Let me give you a little wholesome advice. If you wish to acquire skill in the use of electricity don't set about it alone and don't rely on what you find in text-books. First take a course of instruction in some one of the post-graduate clinics, where electro-therapeutics is practically demonstrated. Attend all the lectures and observe the clinical work. Begin to read everything you can find on the subject. If you can induce a reliable expert to take you as a student for a couple of months, do so, no matter what it costs. As there are various branches of electrical work in which special technique is employed, for instance in genito-urinary and gynecological practice—you should obtain a short course of practical instruction in each. When you have devoted about six months to an apprenticeship of this kind you will have laid the foundation for ultimate success. You will now find that you can weed out obsolete and untrustworthy matter from your reading and you will be able to choose whom to follow and whom to avoid.

You will find that out of every dozen authors more than half of them disagree, and if you attempt to commit to memory all the minor details recommended by each you will be swamped in the midst of confusion. Don't try to remember that in one specified disease the positive pole is used while in another the negative is employed. Ground yourself rather in the action of each pole and the effects of each variety and strength of current. Know just what action you get with the different coils of long, or medium or short wires, and in the sizes used by leading makers. Familiarize yourself also with the relation between different resistances and the current effects through them. When you are master of these general principles the path to successful work is open to you and you can continue to learn with greatly increased facility,

and the more you practice the more you will learn.

While you are doing this you should be getting acquainted with all kinds of apparatus and be able to know good work from bad. In this field there is hardly any middle ground. Either an electrode, meter, battery, etc., is

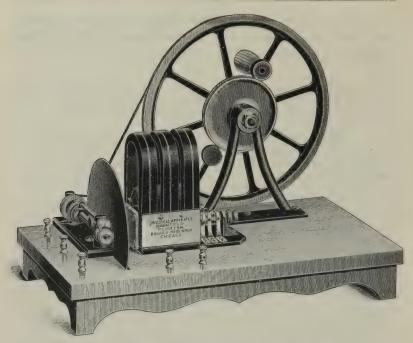
properly made and reliable, or it is worthless.

Probably the most important thing for you at the start is to select the right firm to trade with. A manufacturer may be honest, but that don't necessarily make him understand his business, and you only wish to deal with men who understand their own goods and know how to make them properly.

A manufacturer must keep up with progress or competitors will make goods better and cheaper than he and outsell him, but a doctor will cling to an old electro-magnetic junk shop machine that he has had for twenty years, and

plods right on in his narrow self-satisfied routine.

Weed out dilapidated, by gone apparatus, stop buying coarse and cheaply made goods that have no real therapeutic value. Buy none but the best, strive toward scientific uniformity in the use of improved methods, accurate dosage and clinical records, follow the inspiring lead of the ablest pioneering genius in this field to-day; beware of the misleading electrical literature of the past, master sound principles and continuously develop your technique, and you will possess not merely a single curative agent of inestimable value, but a whole arsenal of weapons, capable of being directed with infinite skill against an ever-increasing variety of morbid states, and constituting, without doubt, the most important ally yet discovered to the still insufficient resources of materia medica.



THE McINTOSH IMPROVED SINUSOIDAL APPARATUS.

The tracings made from this machine by the electrograph show it to be sinusoidal in character, and as improved by this company it is vastly superior in point of construction to anything yet placed upon the market.

The uses of this class of current are largely for improving muscular cell growth, and the contractions are absolutely painless.

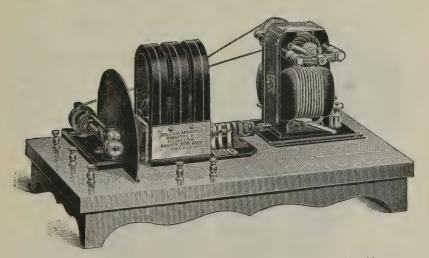
The arrangement for controlling the speed of rotation and consequently for governing the number of alternations per second (there being two alternations for each revolution of the armature) is seen at the left of the cut.

Upon the end of the armature shaft is fastened a brass friction disc which is made to turn by a small leather covered friction wheel, which rests against the disc at right angles to it.

This small wheel can be made to travel either in a large circle (near the edge of the disc) or in a very small circle (near the center of the disc) and in any intermediate circle between these limits, being changed from one position to another quickly and easily while the machine is in motion. A turn of a thumbscrew locks the wheel at any position. Upon the end of the grooved shaft upon which the small friction wheel slides is fastened the driving pulley which in turn is driven by the motive power which can be either hand power,

electric motor, water power, or anything available. The arrangement just described gives wide differences of speed of alternations together with ease of manipulation and smoothness of action, the current can be taken from the machine at either one-third, two-thirds, or its full force, simply by changing the connection of the conducting cords. It was formerly necessary to control this current by a powerful rheostat, but in the improved apparatus the strength of the current can also be regulated by simply turning a screw which decreases the available magnetism of the field magnets by short circuiting them through iron shutters placed between them.

Two binding posts are also provided at the side from which can be taken a direct current giving (with the machine at full speed) a difference of potential of over 40 volts, which current can be used in all cases where an interrupted galvanic current is indicated. The motor which we furnish and which is especially adapted for the work, being small and at the same time powerful, has four changes of speed regulated by a switch underneath.



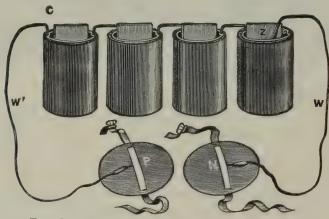
Physicians should remember that prices in this Catalogue, excepting those marked "net," are subject to a liberal discount.

7.00 on the closing pages of this Catalogue will be found a list of the principal dealers who handle our goods. Our batteries and electrodes can be purchased from these houses at the same discount which we offer to physicians.



MCINTOSH ELECTRIC BELT.

This belt has been carefully devised by Dr. L. D. McIntosh for the purpose of meeting all the wants of a mild Galvanic Battery. The belt consists of a combination of cups or cells placed in pockets on the belt, thus forming a complete Galvanic Battery. Each cell is composed of hard rubber lined with copper, which metal constitutes the negative plate. The cells, being covered with hard rubber, are perfectly insulated, or, in other words, do not permit the electric current to pass only on the conducting wires from the poles of the battery; plates of zinc of the proper size and thickness are wrapped in a porous material and placed in the cells; a wire soldered firmly to the zincs connects to the copper of the cells in such a manner as to give a hinge motion, thus making the belt pliable. By simply dropping a few drops of dilute vinegar in each cell, the electric current is generated, and will continue uninterrupted for twenty-four hours. The power of the current is so great that it will decompose water.



THIS CUT REPRESENTS A SECTION OF CELLS FROM THE McIntosh Electric Belt.

By applying the positive and negative electrodes, one to each temple, a sharp pricking or burning sensation, similar to that produced by a strong mustard paste, is felt

It gives a strong or weak current. If a weak current is desired, less cells should be included in the circuit (see directions). The electrodes, or pieces of metal connected by wires with the cells to convey the current to the body, allow of application to any part; the current can be used locally, or the whole system can be brought under its influence. It is light and no discomfort whatever to the wearer.

We do not offer the McIntosh Electric Belt as in any sense a "cure-all." Neither do we offer it in competition with the so-called "cheap" electric belts

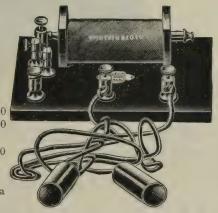
with which the market is flooded.

The McIntosh Electric Belt is a perfect galvanic battery in miniature; the same high quality of material and workmanship which is found in all the articles manufactured by us enters into the manufacture of our Electric Belt, and we make the assertion in the fullest confidence of its truthfulness, that the McIntosh Electric Belt, if used under the intelligent direction of the physician, will afford relief in any case of disease in which the symptoms would indicate the use of a mild galvanic current.

Price.....\$10 00

THE MCINTOSH Induction Coil.

This coil can pe operated with a single galvanic cell of any form.





THE MESCO DRY BATTERY

FOR CALL BELLS AND ALL OPEN CIRCUIT WORK.

The Mesco Dry Battery is a very convenient and powerful cell for use with the McIntosh Induction Coil.

THE MESCO DRY BATTERY IS THE BEST ON THE MARKET.

The Mesco Dry Battery......Price, net, 60 Cents.

We are prepared to furnish these cells in any quantity.



IF YOU DO NOT CARE TO PURCHASE A BATTERY

WHICH LASTS A LIFETIME, LIKE THE MCINTOSH

FAMILY FARADIC BATTERY-PAGE 47.



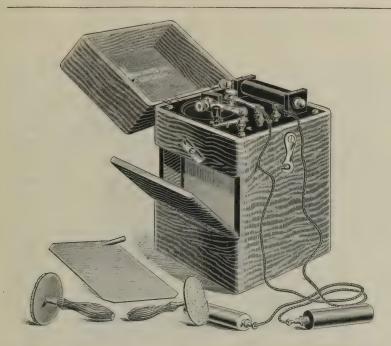
YOU HAD BETTER BUY THE

Humming Bird Battery

PRICE, NET \$5.50

In response to the call for a cheap faradic battery, we offer the "Humming Bird" as vastly superior to the multitude of trashy substitutes for medical batteries with which the market is flooded. We use in this battery the Mesco Dry Cell, the case is polished ash, when closed up the box may lie in any position or be carried safely in a trunk. Conducting cords and metal handles accompany each battery,

When the cell is exhausted send us 60 cents and we will forward new cell. We are not strongly impressed with the value of any dry cell, but there is a demand for dry cells and we believe the Mesco is the best on the market to-day.



THE BEST! THE HANDSOMEST! THE CHEAPEST!

DRY CELL FAMILY BATTERY ON THE MARKET IS

THE LITTLE WONDER.

Price, net, \$8.00.

We use in the beautiful little battery the Mesco Dry Cell. We carry the cell vertically, thus prolonging the life of the cell. It is so simple that it may be placed in operation by the turning of a single switch, and in order to insure against leaving the cell short circuited when the battery is not in use, the plate is so arranged that the lid of box cannot be closed until the switch is turned "off." It is invaluable for patients traveling or moving from place to place.

It will supply the primary, secondary and combined currents, all of which are susceptible of being graduated from a mild to a current of high tension.

The following accessories are contained in the case:

Pair of Metal Handles. Pair of Sponge Disc Electrodes.

Foot Plate. Pair of Cords.

Pair of Insulating Handles for Use with Sponge or any of our Electrodes.

When the cell is exhausted send us 60 cents and we will forward new cell.

H.EMORRHOIDS, TREATMENT BY ELECTROLYSIS.

By JOSEPH B. BACON, of Chicago.

Reprinted from Milwaukee Medical Journal, March, 1893.

The use of electricity for curing fibroid tumors of the uterus having been a decided success in selected cases, many surgeons have recommended it as a curative agent in the treatment of hæmorrhoids. Although statistics are as yet not very complete, and the number of experiments made are not numerous enough to warrant one in pronouncing electrolysis in hæmorrhoids a sure cure, yet the reports of French, English and American authorities are sufficient to encourage us in carrying the experiments further and prove or disprove its usefulness.

I have been trying the method both in private and dispensary practice only a few weeks, and in every case it has caused a decided decrease in the size of the tumors, and in no case was there any secondary hæmorrhage or

sloughing or afterpains, conditions certainly in its favor.

The pain at the time of treatment is slight when applying it to internal hæmorrhoids, but its use for the external variety causes so much pain, especially while the current of electricity is turned on, that an injection of cocaine

into the tumor as a preparatory measure is imperative.

It has been well established experimentally by dermatologists when removing moles, superfluous hairs, etc., by means of electricity that the pain is decidedly lessened if both poles are in proximity when the current is turned on, and in most cases the use of cocaine was thereby rendered unnecessary. With this idea in view I have had an instrument made by the McIntosh Battery Co. of this city that has proven to work quite satisfactorily. It consists of a long pair of forceps similar to urethral forceps, insulated with vulcanized rubber except at a place about one-half inch long on the face of the blades. On the handle of the forceps is a set screw to fasten the wire leading to the battery.

The instrument is used for the positive pole and the hæmorrhoid is seized with the forceps in such a manner as to have the exposed metal of the blades clasp it at its base, when it can be steadily held or drawn down so as to expose it to view while operating. The negative pole is connected with a disk or needle holder, and I prefer one containing at least four needles. After grasping the hæmorrhoid with the forceps a few drops of a 4 per cent solution of cocaine are injected into the tumor, after a few minutes waiting for the anæsthetic effect of the cocaine the needles are pushed into the center of the tumor and an assistant turns on from five to ten milliamperes of current. Immediately there will be noticed an escape of hydrogen around the needles, and a decided blanching of the hæmorrhoids. The current should be kept up until the tumor becomes a whitish gray color, usually requiring from two to five minutes' time.

Microscopical examinations of hæmorrhoids prove them in many cases to be real tumors resulting from original varicosities of the veins that have, through inflammation and rupturing of the vessel walls, left trabeculæ of fibrinous tissue interlacing in through its center. Other hæmorrhoids are composed of arteries and capillaries, in addition to the veins.

The current between the electrodes cauterizes by electrolytic action this

tissue composing the tumor, resulting in its ultimate absorption.

There are some points necessary to observe in using electrolysis in this class of cases:

1. Give an enema and thoroughly empty the colon before operating.

- Disinfect the tumor before introducing the needles, and again after the operation.
 - 3. Never use this method in acutely inflamed hæmorrhoids.

4. Do not use over one-sixteenth of a grain of cocaine hypodermically.

Always insert the needles into the tumor before the current of electricity is turned on, and have the assistant again turn the current off before withdrawing the needles.

 Use a milliampere meter for measuring the strength of current, as it is impossible to estimate the varying resistance of the tissues in different cases.

7. The needles may be a direct source of infection in the hands of a careless operator, and they must be boiled before using.



A MOST EXCELLENT GALVANO CAUTERY BATTERY

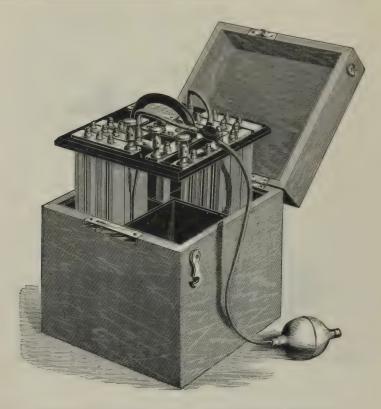
At a Very Low Price.

Size of base, 8 x 16 inches; size of jars, 6 x 8 inches.

In order to meet the wants of physicians who desire a very cheap form of office cautery battery for occasional use on light actual cautery operations on the eye, ear, nose and throat, we offer a very effective battery similar in appearance to above cut.

PriceNet, \$12 0)()
The above battery with galvano cautery cords and case of elec-	
* trodes containing complete handle, and four cautery elec-	
trodes. PriceNet, 26 2	25

Physicians should remember that all prices in this Catalogue except those marked "net" are subject to a liberal discount.



McIntosh Portable Galvano-Cautery Battery.

Price, \$80.00.

This battery is designed expressly for cautery work. It is inclosed in a polished black walnut case, $8\frac{1}{2}$ inches long, $8\frac{1}{2}$ inches wide, and $10\frac{1}{2}$ inches high, and weighs 21 pounds. The elements are composed of zinc and platinum, fastened upon a hard rubber base. They are constructed so as to furnish a very large surface in the smallest possible space, thereby lessening the resistance and increasing the power of the battery. The cells and drip cups are made of hard rubber. The base and elements can be fastened at any height by a spring bolt that slips into slots in a central upright metallic tube; by this means the current can be graduated to any required intensity. This battery is very compact, portable, and can be easily managed by any physician. It is adapted to all cases where galvano-cautery is applicable.



Our Stationary Cautery Battery stands on a base 12×20 inches, 26 inches high, and is inclosed in a neat walnut case. The elements are large zinc and carbon plates, which are raised and lowered in the fluid by means of a lever on outside of cabinet, thus enabling the operator to obtain any degree of heat desired. It is best adapted to office work.

The improvements lately made in this battery render it the most desirable and profitable battery for the physician whose limited need for Galvano Cautery does not warrant the purchase of a Storage Battery.

MCINTOSH STATIONARY CAUTERY BATTERY Price, \$72.00.



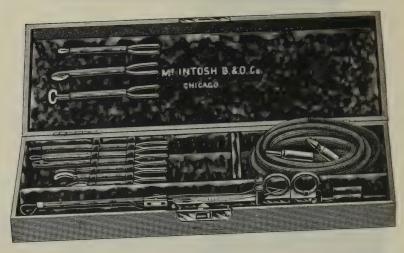
GALVANO-CAUTERY CORDS.

The powerful current required for galvano-cautery makes it necessary to have special cords with large conducting surface. The conducting cords furnished with ordinary batteries are inadequate to convey a cautery current.

The galvano-cautery cords furnished with the Portable Cautery Battery consist of a bundle of copper wires, insulated by a heavy silk cover, with large tips, which secure the ends of the wires, and offer no impediment to the passage of the current. These cords are very flexible, and being perfect conductors they do not become heated while the battery is being operated.

Price, per pair\$3 00

GALVANO-CAUTERY ELECTRODE CASE.



Price.....\$28 00

This case contains one pair of cautery cords, one cautery handle and ecraseur attachment, nine platinum electrodes and wire loop for ecraseur.



MCINTOSH CAUTERY HANDLE WITH WHEEL ATTACHMENT FOR ECRASEUR.

This is the style of handle preferred by most surgeons.

Price, as shown in cut (without ecraseur attachment)..........\$7 60



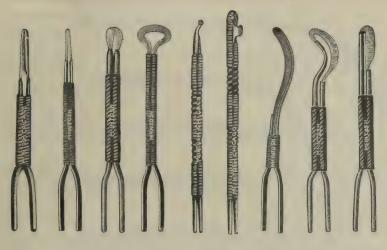
GALVANO-CAUTERY HANDLE WITH ECRASEUR ATTACHMENT.

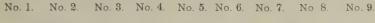
This represents the Galvano-Cautery Handle arranged for the loop or ecraseur.

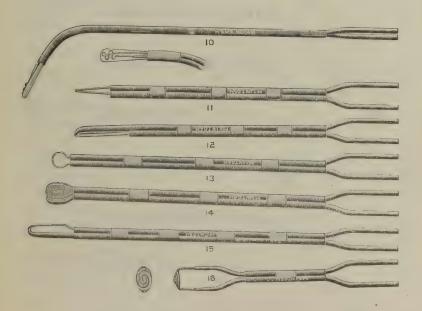
Price, complete as shown in cut\$9 00
Extra Platinum Wire Snareseach, net, 1 00

Batta I latinum vino Gharos,

For other styles of Galvano-Cautery Handles see page 169.

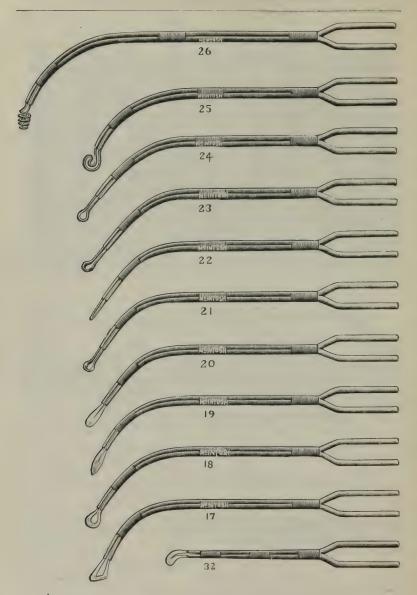






GALVANO-CAUTERY ELECTRODES.

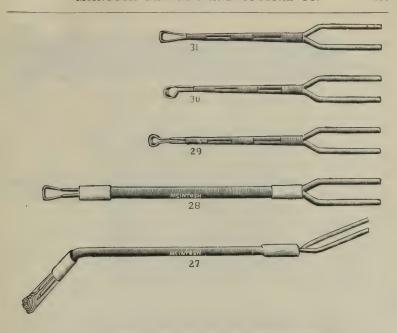
Special forms of Galvano-Cautery Electrodes made to order



GALVANO-CAUTERY ELECTRODES,

LARYNGEAL CURVED.

SEE PRICES ON NEXT PAGE.



GALVANO-CAUTERY ELECTRODES.

17.	Oblique Knife Electrode	2 00
18.	Knife Electrode, broad loop	2 00
19.	Knife Electrode, lancet	2 00
20.	Knife Electrode, flat	2 00
21.	Loop Electrode	2 00
22.	Point Electrode	2 00
23.	Curette Electrode, curved	2 00
24.	Curette Electrode, straight	2 00
25.	Spiral Flat Electrode	2 00
26.	Spiral Dome Electrode	2 00
27.	Bosworth's Post-Nares Electrode, with shield	3 00
28.	Bosworth's Naso-Pharynx Electrode	2 50
29.	Nasal, Curette Electrode, straight	1 60
30.	Nasal, Curette Electrode, curved	1 60
31.	Nasal, Square Knife Electrode, flat on top	1 60
32.	Nasal, Knife Electrode, curved	1 60



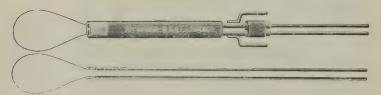
GALVANO-CAUTERY HANDLE.

This handle can be used with any of our Cautery Electrodes, except the loop, which requires the ecraseur attachment.

Price.....\$7 60



This represents the Galvano-Cautery Handle arranged for the loop or ecraseur.



Dr. H. W. Loeb's Improved Galvano-Cautery Snare, for use with the Slide Handle.



Consists of complete Cautery Handle, with four Electrodes. This is the cheapest Galvano-Cautery Case on the market, but is only recommended for light work.



THE JEWELL CAUTERY TRANSFORMER.

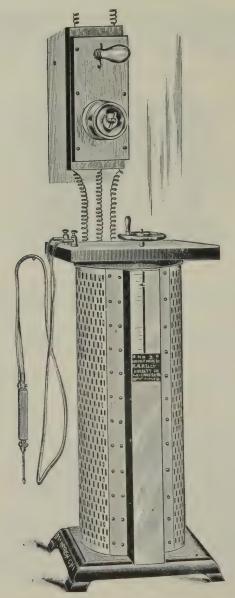
The above cut illustrates the latest and most approved form of the Cautery Transformer for use on alternating house circuits of 50 or 52 volts.

The Transformer is designed to give large current for heating cautery knives, lighting small lamps, etc. The voltage may be adjusted (by turning the milled wheel in the center of the top) from one volt up to twelve volts.

The maximum voltage is obtained when the threaded rod in the center is down. The 50 or 52 volt house current is applied at the binding posts on the side of the instrument and may be taken from an ordinary incandescent lamp socket, and the cautery knife or lamp is connected to the binding posts on the top of the instrument. The Transformer, when heating the cautery knife, requires about the same current as an ordinary incandescent lamp.

We warrant this Transformer to give perfect satisfaction on any of the ordinary alternating lighting circuits.

Price	 Net.	\$25 00



THE K. A. P. DYNAMIC CAUTERY APPARATUS.

PRICE, NET, \$60.00.

DELIVERED F. O. B CHICAGO.

THE "K. A. P. DYNAMIC CAUTERY APPARATUS."

This instrument is designed to be used on incandescent circuits for the purpose of heating cautery knives and burning small, low volt surgical lamps, such as are used by physicians for examining the throat, etc. The advantages of this device for galvano-cautery work are as follows:

- 1st. The physician or surgeon can use it 24 hours per day, if necessary, and obtain the same result throughout the entire length of time; that is, it cannot be exhausted.
- 2d. It is regulated with perfect ease by the operator to burn a small lamp requiring less than one ampere of current, or heat the largest cautery knife or loop taking from 10 to 20 amperes.
- 3d. It is made to operate on any constant current of 110 volts, and should have a supply current of 15 amperes for the heaviest cautery work.
- 4th. This instrument is strictly fire-proof, but the current should not be left on longer than is really necessary. We have therefore, placed an incandescent lamp in the switch circuit to warn the operator when the current is turned on or off.
- 5th. The cost of operation is very small compared with batteries. It will cost from 10c. to 20c. per hour on 110 volt circuit where the rate charged for current is 1c. per ampere. As physicians and surgeons know it is used only a few minutes in an operation, the cost of operating is comparatively small.
- 6th. There is nothing about the instrument to wear out, but should it get out of order at any time the manufacturers offer to make repairs free of charge, except cost of transportation.
- 7th. The only expense to the purchaser in addition to cost of the apparatus is transportation, signal lamp, and whatever charge may be made by the local company for connecting into the commercial circuit.

Diagram of wiring and full instructions are furnished with each instru-

To We are not the manufacturers of this apparatus, but offer it to the profession with perfect confidence in its great value and perfect adaptability in all of the work it is intended to perform

STORAGE BATTERIES.

We recommend only those storage batteries which, in our own experience, have proved efficient and valuable.

We do not guarantee any storage battery. Their durability and efficiency depends upon the care of the user.

Give your storage battery the same care which you would bestow upon a horse which you desired to preserve in his best condition for work, and "like your horse" it will always respond promptly to your demand for service. Query. Would you own a horse if you could not make use of him oftener than once a month? No more can you afford a storage battery to stand simply as an ornament in your office.

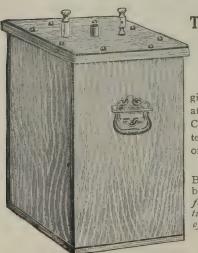
A storage battery is par excellence, the battery for constant work in galvano cautery.

A plunge cautery battery is the correct thing for the physician whose practice requires galvano cautery only at brief intervals.

WE HAVE NEVER BEEN DISAPPOINTED IN THE EFFICIENCY

AND DURABILITY OF

THE AMERICAN STORAGE BATTERY.



The Only Storage Battery

MANUFACTURED IN THE UNITED STATES

TO RECEIVE A DIPLOMA.

The following is a copy of the award given by the judges of storage batteries at the World's Columbian Exposition, Chicago, 1893, to the only storage battery made in this country deemed worthy of any notice whatever:

"We affirm that the 'AMERICAN' BATTERY has been examined and tested by us, and found worthy of an award for its excellency of design and construction, and for its efficiency and indications of durability."

(Signed) WILBUR M. STINE. W. LOBACH.

THE AMERICAN NUMBER ONE.

TYPE T. P. 4.

We ship the this battery fully charged, by freight, to all points in the United States.

The capacity of this cell is 2 volt and 150 amperes. Two of the Number One cells, with McIntosh Storage Cautery Battery Rheostat, makes the very best cautery battery.

Price of 2 Number One cells with rheostat..........Net, \$38 00

The very best storage battery in the world for operating a ½ H. P. Motor. For this purpose 3 cells are required.

Price of 3 Number One cells with controlling rheostat, net, \$60 00

We recommend the 150 ampere cell as the best and always reliable. We can furnish, however, the same size plate put up as a 75 ampere battery, in same style case as the 150 ampere size.

AMERICAN STORAGE BATTERY NUMBER TWO.

TYPE T. P. 2.

In ash case, size 6½x9x12, weight 36 lbs.....Price, net, \$12 00 The capacity of this cell is 2 volts and 75 amperes.

Price of 2 cells, Number Two, with rheostat...... Net, \$28 00

We ship this battery fully charged, by freight, to any point in the United States.

Note.—We do not manufacture or repair storage batteries. All cells sent to us for repair or for charging are at once placed in the hands of the manufacturers, and the work performed with the greatest care. We are not responsible for breakage or loss after shipping or delivering goods and obtaining receipt for them in good order.

FOR GALVANO-CAUTERY WORK A GOOD RHEOSTAT IS INDISPENSABLE.

The current from these batteries is perfectly controlled by the McIntosh Cautery Battery Rheostat, especially designed for this battery. By the use of this Rheostat the most delicate lamps are maintained at their full brilliancy without fear of destroying the lamp by excess of current. Cautery knives, from the smallest to the largest, are brought to a white heat and held at an unvarying temperature during a more or less protracted operation. And in connection with the electric motor, the speed of the motor is increased or diminished at the will of the operator by a slight movement of the lever of the rheostat.



PATENT APPLIED FOR.

THE MCINTOSH STORAGE CAUTERY BATTERY RHEOSTAT.

Giving from 0 to 3 ohms resistance (suitable for cautery current).

Price\$10 00

We use this Rheostat on all of our Storage Cautery Batteries.

To use the Storage Battery for Cautery Work.

Connect the cautery handle with the cords, and lastly (the rheostat is always in circuit) with the front binding posts of the rheostat. Move the rheostat switch back to R until all the resistance is placed in the circuit, then press the button upon the cautery handle and gradually move the rheostat switch forward, thus reducing the resistance until the cautery electrode is heated to nearly a white heat. If care is used, the smallest to the largest electrode can be used without burning them out.

To Light any 4-Volt Lamp. Connect by suitable handle and cords with the front binding posts of theostat, throwing in all the resistance and gradually lessening it until the proper degree of illumination is obtained.



SMALL MOTOR REGULATOR.

We furnish this style of Rheostat to regulate the speed of motors operated by storage batteries,

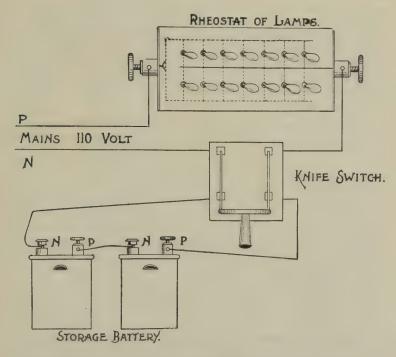
Price......\$6 00

MOTOR REGULATOR.

FOR USE WITH THE EDISON INCANDESCENT CURRENT.

The charging switch-board described on page 182 can be used to regulate the speed of the ½ H. P. motor, by using for the purpose suitable lamps.

In the cut on page 182 we show the three lamp charging switch in use as a motor regulator.



DIRECTIONS FOR CHARGING FROM AN INCAN-DESCENT LAMP CIRCUIT.

To prevent too great a flow of current, resistance must be inserted in circuit, which may be in the shape of incandescent lamps in multiple, or iron wire coils. Each 110 v. 16 c. p. lamp in multiple is equal to one-half ampere of current. Positive wire of line must be connected to positive terminal of battery, negative wire of line to negative terminal of battery. Time required for charging is governed by rate of charging current. Add ten per cent to rated capacity in ampere hours and divide result by charging rate in amperes to obtain time in hours. For instance, type P 4 for ordinary work is rated at about 270 ampere hours, adding ten per cent makes 300; thus should the charging rate be 15 amperes, to obtain full charge, cell or cells should be left in circuit, 300 divided by 15 or 20 hours.

Always switch battery in circuit after current is put on, and off, before current is shut off, using any good dead-cut, as shown in diagram.

In setting up cells make clean, tight connections throughout. See that all joints are covered with a reliable acid proof paint or tape.

A simple test for determining the polarity of "live" wires is to dip the ends into a vessel containing water slightly acidulated. Bubbles will be given off in much greater volume at the negative than at the positive poles.

To indicate the direction in which a current is flowing through a wire, hold an ordinary pocket compass over it so that the N and S points of the scale are directly over and in same direction as the wire. If the current is flowing toward the N point, the needle of the compass will swerve to the east; if current is flowing in opposite direction, needle will turn to the west. Any direct current may be utilized for charging cells. The alternating current is not available.

Time of Charging.—The cells should receive from 350 to 490 ampere hours' charge. Divide 350 or 400 by rate of charge, gives time necessary to charge cell.

Care of Storage Cells.—Before charging the cells, unscrew binding posts, then take out screws and with care lift off wood cover, unscrew vent and fill up the cell to within ½ inch of top with clean soft water. In case the cell has been leaking, use a solution instead of water. To make the solution, take chemically pure sulphuric acid; mix one part of acid to five parts of water; this should be 23 Baume, or a specific gravity of 1.189. Mix the acid and water in a stone or glass jar, and let it stand four hours to cool before placing it in the cells.

CAUTION.—Do not spark the cells, or hold a flame over the vent while charging.

Never lift the storage cell by one handle, or turn it over on its side.

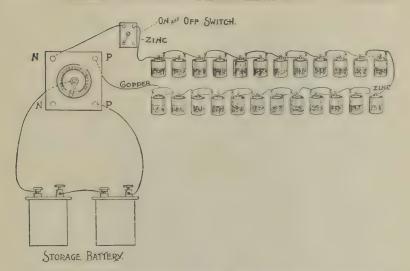
Charging Switch.—We keep in stock charging boards all ready for connecting in the electric light circuit in the physician's office. These rheostats are arranged to deliver current to the battery at rate of one to five amperes per hour. See page 182.

To Charge with Hussey Patent Blue Stone Batteries.—Use for the 150 ampere battery twenty-four Hussey cells (6x8 Gravity cells can be used, but the Hussey Patent Blue Stone Batteries will be found to be much more efficient and satisfactory).

NOTE.—It will be found to be very expensive and troublesome to keep a battery of 150 ampere cells, charged from either Hussey or Gravity cells. We do not advise the use of storage batteries unless access can be had to a constant current dynamo for charging the cells at regular intervals.

When using Gravity or Hussey cells to charge the battery, the terminals of the charging battery may be left permanently connected with the charging posts of the rheostat; in this way the amperage of the storage battery can be kept up to its full working capacity.

The binding posts at back of rheostat are the charging posts; those in front are the posts to which the electrodes must be attached.



CHARGING STORAGE FROM PRIMARY BATTERIES.

We do not manufacture or repair storage batteries — All cells sent to us for repairs or for charging are at once placed in the hands of the manufacturers and the work performed with the greatest care. We are not responsible for breakage or loss after shipping or delivering goods and obtaining receipt for them in good order.

Hundreds of the American Number One Cells are in use, and we have not heard a complaint in regard to them. On the other hand, we assert, in the full knowledge of the facts, that storage batteries constructed of small plates will always prove unsatisfactory and unprofitable.



"CHLORIDE" SURGICAL BATTERIES.

GENERAL DESCRIPTION.

The "Chloride" Surgical Batteries are constructed upon correct modern principles—from both mechanical and electrical standpoints. No reasonable expense is spared to make them the best, in every respect and in important details—notably the insertion of a "pilot lamp," and the use of two rheostats, one for cautery and the other for illumination—they are radically different from other forms.

Being "Storage" or "Secondary" batteries, almost the entire success of work to which they are applied, depends upon the LEAD PLATES used, and to these particular attention is desired.

The "Chloride Accumulator" received last year—1894—the "John Scott Premium and Medal" from the Franklin Institute, Philadelphia, because it is a "Noteworthy and meritorious improvement upon many other forms of lead battery, tending to greater durability, greater capacity without increase of weight, and making possible heavier discharges without injury."

The established fact that in all classes of Storage Battery work, the "Chloride Accumulator" is rapidly supplanting other and older types, should convince prospective purchasers that batteries of this form, manufactured and mounted expressly for application to Medicine and Surgery, must prove thoroughly efficient and satisfactory to the general practitioner as well as to the specialist in Eye, Ear, Throat or Nose work.

Directions for the care of the "Chloride" Surgical Batteries and for recharging them are supplied with each apparatus.

"CHLORIDE" SURGICAL BATTERY, NO. 125.

Net Price.....\$45.00

Specifications.—Handsomely finished mahogany case, with leather strap. Outside dimensions, $14\frac{1}{2} \times 8\frac{1}{2} \times 6\frac{3}{2}$. Contains two "Chloride" Accumulator Cells, Type D5, with normal capacity of 50 ampere hours. Fine regulation is obtained by means of a smooth working wire rheostat, so that Cautery Electrodes requiring any current between 1 and 45 amperes, or a lamp of 4 volts, can be operated with this battery. A "Pilot Lamp" is furnished, and all binding posts are rubber covered. Weight, complete, charged and all ready for use, 45 lbs.



"CHLORIDE" SURGICAL BATTERY, NO. 135.

For Cautery or Lamp Illumination.

Net Price..... \$50.00

Specifications.—Handsomely finished mahogany case, with leather strap. Outside dimensions, $14\% \times 10\% \times 6\%$ inches. Contains three "Chloride" Accumulator Cells, Type D5, with normal capacity of 50 ampere hours.

A smooth working wire rheostat affords perfect control of the current for electrodes of any capacity between 1 and 45 amperes. The cells are arranged n series, giving 6 volts for a surgical lamp. In general construction this battery is precisely similar to No. 125. A "Pilot Lamp" is furnished and all binding posts are rubber covered. Weight of No. 135, complete, charged and ready for use, 55 lbs.

THE CHLORIDE ACCUMULATOR.

The acid to be used should have a specific gravity in the first instance of 1300 (33 degrees Baumé), at which strength it should be maintained when the cells are fully charged.

In preparing the dilute sulphuric acid a good commercial acid of 66 degrees Baumé may be used, in the proportion of three parts of water to one of acid; by volume, not by weight. The acid must be cold when poured on the element. In mixing the acid and water pour the acid slowly into the water; on no account pour water into acid.

When it is necessary to obtain the maximum discharge the cells should be charged to 2.7 volts, although, in general use, it is not necessary to charge the cell to that point, 2.5 being sufficient. It will be found that this element will read high, both in charge and in discharge. The cells may be discharged down to 1.7 volts each without injury. Volt readings should be taken on closed circuit, when cells are charging or discharging at normal rates. When the cells are set up, the first charge should be continued for twenty hours.

Where accurate voltmeters are not used to determine the amount of charging necessary, it is advisable to put into the cell about 10 per cent more current than it has delivered.

All connections should be firmly made after the parts of contact are made clean and bright. The positive lug is dark colored. The negative lug is always connected to the outside plates, and consequently to the larger number—that is, an 11-plate element has 5 positive and 6 negative plates.

Care should be taken to keep the plates entirely immersed in acid, although it is not necessary to have the acid more than half an inch above the top of the plates.

The cell will not give its maximum capacity until it has been subjected to from 10 to 15 discharges, but will have at first about three-fourths of its maximum. Cells should not be allowed to remain idle after 75 per cent of their capacity has been taken out of them.

When cells are to remain idle for a period longer than two months, charge them up thoroughly, and then discharge for about two hours at normal rates. Remove the acid from the cells and rinse them out thoroughly with clean water. When next required for use, replace the acid and charge at normal rates for not less than eighteen hours.



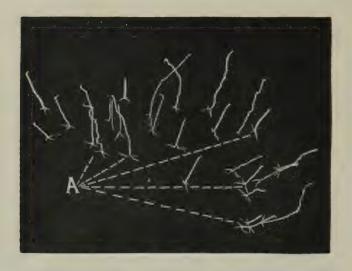
NEW COMBINED MEDICAL AND STORAGE BATTERY.

It consists of two storage cells, with a rheostat which controls the current so exactly that any desired heat can be obtained in the cautery point; the same perfect control applies to illuminators. Besides this, we give you a faradic current of superior quality for all medical treatment, where such current is indicated. Weight only 17 lbs.

Price, Net.....\$60.00.

Note.—The above storage battery is constructed differently from any other battery on the market. By using glass wool and a rubber confining box to hold the active material in place, thereby dispensing with the lead grids, the weight is reduced one-half, and the battery rendered more durable. No disintegration or buckling. The cells can also be charged and discharged at a much higher rate than any other, without fear of injury. The battery can be handled by the most inexperienced without danger of injury.

Physicians should remember that all prices in this Catalogue, excepting those marked "net," are subject to a liberal discount.



THE STATIC SPARK.

The late Plym. S. Hayes, M. D., was one of the most enthusiastic workers in this field of therapeutics, and made many valuable contributions to its literature which have found ready entrance into home and foreign journals. Just prior to his last illness he was engaged in some researches by which he sought to demonstrate the unity in therapeutical action of all forms of electrical energy, the apparent differences being those of degree only and not of kind. In experimenting with the static charge in the treatment of a carcinoma of the breast he made some photographs of the sparks as they passed from the electrode to the skin. He was especially interested in noticing that at the instant the spark approached the cutaneous surface it divided, taking a number of paths which he concluded to be lines of least resistance, presumably the mouths of sebaceous follicles and sweat glands. This division of the spark, resembling a crow's foot, is well illustrated in the accompanying figure which is a reproduction of some of these photographs.—Bulletin, Ann Arbor, Mich.

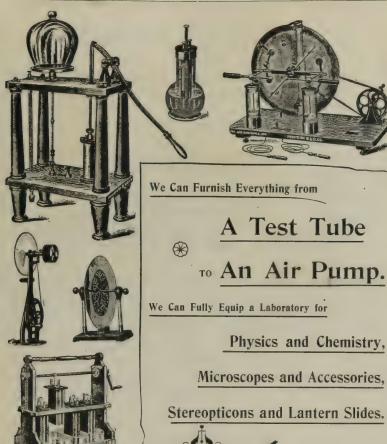
[Extract from letter of Dr. J. J. Diet, New Orleans, Dec. 8, 1891.]

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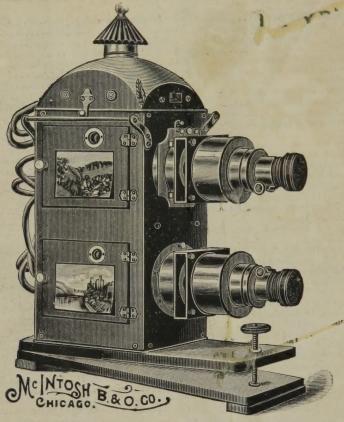
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